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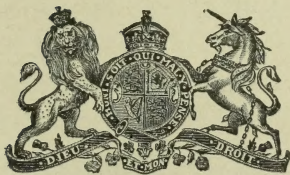
ANNUAL REPORT

REMOTE OF THE STORAGE

TOPOGRAPHICAL SURVEYS  
BRANCH

1910-1911

*PRINTED BY ORDER OF PARLIAMENT.*



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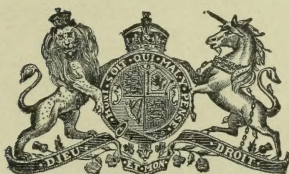
ANNUAL REPORT

REMOTE <sup>OF THE</sup> STORAGE

TOPOGRAPHICAL SURVEYS  
BRANCH

1910-1911

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OTTAWA

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## REPORT

OF THE

## SURVEYOR GENERAL OF DOMINION LANDS

1910-1911

DEPARTMENT OF THE INTERIOR,  
TOPOGRAPHICAL SURVEYS BRANCH,  
OTTAWA, September 6, 1911.

The Deputy Minister of the Interior,  
Ottawa.

SIR,—I have the honour to submit the following report of the Topographical Surveys Branch for the year ended March 31, 1911.

During 1910 surveys under the Dominion Lands system were continued in the western provinces under the usual organization. Eighty-eight parties in all were employed, seventy-three of these being regular parties engaged for the season and fifteen being parties organized for special surveys and engaged for short periods only. Of the seventy-three regular parties thirty-nine were employed by the day and thirty-four were working under contract. Those working under contract were engaged exclusively on township subdivision surveys, while, of those employed by the day, five were engaged upon the inspection of surveys executed under contract, eight on base lines and initial meridians and twenty-six on miscellaneous surveys and resurveys.

The weather throughout the season was, on the whole, very favourable for survey operations. In the southerly districts there was an unusually light rainfall but surveyors in outlying districts to the north report that precipitation was ample and that grasses and wild plants, where found, were growing luxuriantly. The amount of work performed by each party during the season compares well with the work of previous years. The following is a statement of the average number of miles of survey per party for the last four seasons :—

1910 . . . . .	279 miles.
1909 . . . . .	412 "
1908 . . . . .	366 "
1907 . . . . .	364 "

The falling off in the mileage for 1910 is accounted for by the fact that during 1907, 1908 and 1909 a large proportion of the surveys were in prairie districts while all the surveys of 1910 were in country more or less wooded.

One hundred and eighty-three whole townships and twenty-three fractional townships were completely subdivided while a partial subdivision was made of four hundred and nine others. Complete resurveys were made of eight townships and a partial resurvey of one hundred and eighty-nine others.



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The survey parties employed during the season were distributed as follows :

PARTIES.	In Man.	In Sask.	In Alta.	In B. C.	Partly in one Province and partly in another.	Total.
Paid by the day .....	1	2	16	10	10	39
Under contract .....	1	12	21	.....	.....	34
Engaged for a short time only .....	.....	5	4	6	.....	15
Total .....	2	19	41	16	10	88

#### SURVEYS OF BLOCK OUTLINES.

Eight surveyors were employed on the surveys of base lines and initial meridians. These lines are situated in outlying portions of the country out of reach of railway transportation and surveyors as a rule make arrangements to have supplies taken in over the winter roads and cached at convenient points in the vicinity of their work. One of their great difficulties is thus overcome and they can push forward with their work without fear of the failure of their food supply for men and horses. In all about nine hundred and ninety miles of governing lines were surveyed during the year. Each surveyor prepares a sketch map showing the topographical features of the country for twelve miles on each side of the base or initial meridian and a report as to its natural resources, etc. In this way the Department is furnished with much valuable information that cannot be obtained otherwise.

Mr. Wm. Christie, D.L.S., completed the survey of the eighteenth base and established the twentieth base across ranges one to nine inclusive, west of the fourth meridian.

Mr. A. W. Ponton, D.L.S., continued the production of the fifth meridian to the north of township 112 and established the twenty-eighth base westerly therefrom across ranges one to seventeen inclusive, and the twenty-ninth base across range one. He began this survey in the summer of 1909 but was retarded considerably by wet weather and by the loss of his supplies and instruments through an accident on Peace river. He found considerable areas along the meridian and on the twenty-eighth base flooded from the heavy rains which were prevalent in that district. The survey of the twenty-eighth base will enable the Department to subdivide the lands in the vicinity of Vermilion under the Dominion Lands system when the necessity arises. Mr. Ponton reports that the soil there is good and the country well suited for agriculture.

Mr. George McMillan, D.L.S., continued the surveys of the sixteenth, seventeenth and twentieth base lines west of the sixth meridian. He remained in the field during the whole year and is now surveying the base lines and outlines of the block of three and one-half millions of acres conveyed by the province of British Columbia to the Dominion. The base lines already surveyed in this block will allow of the subdivision into townships of the district known as Pouce Coupé prairie.

Mr. A. Saint Cyr, D.L.S., surveyed the third meridian from township 60 to the seventeenth base line and established that base westerly across ranges one to twelve. His report shows that there are large areas of valuable timber in that region and extensive stretches of good farming land. On the north shore of Sled river in township 63, range ten, there is a settlement of half-breeds who have cleared the land and are growing all the ordinary vegetables successfully, as well as hay and oats. Fishing is, however, the great industry at present.

Mr. B. J. Saunders, D.L.S., had instructions to survey the nineteenth base line west of the fourth meridian. Owing to the scarcity of supplies, the extreme cold and



## SESSIONAL PAPER No. 25b

the great difficulties of making trails he was compelled to abandon the work after the line had been established across five ranges only.

Mr. J. N. Wallace, D.L.S., beginning where he left off in 1909 produced the fourth meridian as far as the northeast corner of section 13, township 95. Mr. Wallace has had many years of experience on the survey of initial meridians and base lines in the western provinces but he states that the difficulties of his surveys of 1910 were greater than any he had ever before encountered. His report which is published as one of the appendices of the report of the Topographical Surveys Branch gives an interesting description of the country through which that portion of the fourth meridian passes. A sketch map of the portion of the fourth meridian surveyed by Mr. Wallace in 1909 was published with the report of the Topographical Surveys Branch last year but as no profile was then ready a sketch map and profile for the whole portion of the line surveyed by Mr. Wallace in both 1909 and 1910 are published with this report.

Mr. A. H. Hawkins, D.L.S., completed the survey of the twenty-first base line west of the fifth meridian. He began at the east boundary of range nineteen and produced the line east as far as the meridian. This base line passes through a fairly level country about sixty per cent of which is fit for agriculture. This percentage can be greatly increased by proper drainage. The soil is good and the surface is covered with a luxuriant growth of grass and pea-vine. All that is necessary to open up this valuable tract of country is railway transportation. Already large gardens are under cultivation at Atekamic and Wabiskaw lakes.

Mr. E. W. Robinson, D.L.S., during the summer of 1910 produced the principal meridian north to lake Winnipeg and established the eighth base east of the principal meridian east to lake Winnipeg and completed the survey of the ninth base west of the principal meridian. The country through which these lines run is mostly swamp and muskeg rendering the surveys very difficult but yet the whole distance of over one hundred miles was completed in six months.

During the winter Mr. Robinson produced the second meridian from township 56 to the sixteenth base and established the fifteenth base west of the principal meridian easterly from the second meridian to range twenty. From this base it will be possible to subdivide into townships under the Dominion Lands system the lands in the vicinity of The Pas as the surveys are required. He reports that at present there is little land in that vicinity fit for cultivation but thinks that, with proper drainage, it will make first-class wheat land.

## TOWNSHIP SUBDIVISION SURVEYS.

Where contract rates for township subdivision are not applicable parties under daily pay are employed to make the surveys. During 1910 nine parties were engaged upon these surveys.

Mr. J. R. Akins, D.L.S., subdivided portions of townships twenty-one, twenty-two and twenty-three, range nine, west of the fifth meridian. The object of the subdivision surveys in these townships was to enable the Department to deal with lands covered by applications for coal leases. Before subdivision lines under the Dominion Lands system could be projected into these townships it was first necessary to produce the sixth base line across ranges seven, eight and part of nine from the Elbow to the Kananaskis valley. This was also done by Mr. Akins. The country is very rough and survey operations are carried on under great difficulties. An idea of the accuracy which is obtainable under the present system of making surveys may be gathered from the following statement by Mr. Akins:—

“We at length succeeded in getting both the line and triangulation over into the Kananaskis valley and here we checked our work by measuring the side of a tri-



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angle which had already been calculated and we found that the two checked to about a link."

Messrs. W. A. Scott, D.L.S., and J. L. Lang, D.L.S., carried on subdivision surveys in the foot-hills of the Rocky mountains in the vicinity of Livingstone, Oldman and Southfork rivers. Both parties were greatly handicapped by smoke and fire and were obliged to spend considerable time in assisting the Dominion Fire Rangers in fighting the fires. Mr. Scott during the last part of the season was employed on miscellaneous retracement and traverse surveys in southern Saskatchewan.

Messrs. J. Francis, D.L.S., J. B. McFarlane, D.L.S., O. Rolfson, D.L.S., and A. L. McNaughton, D.L.S., subdivided townships along the Saskatchewan, Brazeau and Pembina rivers in which coal claims are located. The country is very rough and covered with fallen timber which renders survey operations slow.

Mr. A. L. Cumming, D.L.S., was engaged in projecting township subdivision westerly along the line of the Grand Trunk Pacific railway from range twenty-five to the sixth meridian.

Mr. W. A. Ducker, D.L.S., made the necessary surveys of township outlines to define the limits of Porcupine Forest reserve west of the north end of lake Winnipegosis.

#### CORRECTION, RESTORATION AND MISCELLANEOUS SURVEYS.

Traversing lakes and rivers, correcting errors in previous surveys, retracing erroneous lines and restoring obliterated monuments are some of the miscellaneous surveys which are done by parties under daily pay.

Mr. C. F. Aylsworth, D.L.S., was occupied on resurveys in southeastern Saskatchewan and retracement surveys in Manitoba.

Mr. W. F. O'Hara, D.L.S., resurveyed a number of townships along the international boundary in Alberta. He also subdivided the R.N.W.M.P. reserve at Pincher Creek and made a survey of villa lots at Waterton lakes in townships 1, ranges twenty-nine and thirty, west of the fourth meridian.

Mr. P. A. Carson, D.L.S., was employed on small miscellaneous surveys in southern Saskatchewan and Alberta. His work included the correction of errors in the original subdivision, the reestablishment of lost corners, the traverse of water areas and investigation of dried up lakes and resurveys applied for. In all he completed about fifty separate jobs during the season.

After the close of his operations in the mountains of British Columbia, Mr. M. P. Bridgland, D.L.S., was employed on miscellaneous surveys in Alberta and Saskatchewan, similar to those performed by Mr. Carson.

Messrs. Carl Engler, D.L.S., E. L. Burgess, D.L.S., and F. H. Kitto, D.L.S., all permanent members of the office staff were sent to the field for short periods to make special surveys for the Department.

Mr. Engler determined by latitude observations the position of the northern boundary of Alberta and made a survey of Smith Landing settlement.

Mr. H. W. Selby, D.L.S., made a settlement survey at McMurray and Athabaska Landing and an adjustment of settlers' claims at these places. On his return trip from McMurray Mr. Selby was accidentally drowned in the Athabaska river. He had been connected with Departmental surveys more or less since 1883 and continuously since 1902. He was a devoted public servant and was selected for the difficult task of adjusting claims in these settlements on account of his tact, fidelity and excellent judgment.

Mr. Wm. Ogilvie, D.L.S., surveyed a water-power site for the city of Prince Albert, at Cole falls on Saskatchewan river.

Mr. W. Thibault, C.E., was employed on a reconnaissance of Winnipeg and English rivers to determine the most suitable locations for storage reservoirs for water-power development.



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Other surveyors employed for short periods only on miscellaneous surveys such as small traverses, timber berths, etc., were Messrs. G. B. Bemister, D.L.S., H. P. Keith, D.L.S., H. G. Phillips, D.L.S., W. R. Reilly, D.L.S., J. E. Woods, D.L.S., and H. B. Proudfoot, D.L.S.

## BRITISH COLUMBIA SURVEYS.

Eight parties continued the subdivision of Dominion lands in the railway belt, British Columbia. They were in charge of Messrs. J. E. Ross, D.L.S., G.H. Blanchet, D.L.S., D. A. Smith, D.L.S., P. B. Street, D.L.S., W. J. Deans, D.L.S., A. Lighthall, D.L.S., T. H. Plunkett, D.L.S., and L. D. N. Stewart, D.L.S.

Mr. A. W. Johnson, D.L.S., continued a survey of villa lots at Woodhaven on the North Arm of Burrard Inlet.

Messrs. A. J. Campbell, D.L.S., and R. D. McCaw, D.L.S., continued the examination and classification of the vacant lands in the valleys of the railway belt, British Columbia. Mr. Campbell worked in the New Westminster district and had under his direction a sub-party in charge of Mr. G. A. Bennett, D.L.S. Mr. McCaw worked in the Kamloops district and had a sub-party in charge of Mr. A. V. Chase, D.L.S. By the classification the lands are divided into fruit lands, farming lands, grazing lands, timber lands and worthless lands.

Mr. M. P. Bridgland, D.L.S., continued the triangulation survey through the Selkirk mountains which had been begun by Mr. P. A. Carson, D.L.S., in 1908 and 1909.

Mr. E. Bartlett, D.L.S., made an investigation of squatters' claims in the railway belt, British Columbia, in the vicinity of Golden in the Upper Columbia valley.

Messrs. J. H. Brownlee, D.L.S., P. C. Coates, D.L.S., J. A. Kirk, D.L.S., and G. L. Williams, D.L.S., were employed for short periods on the survey of timber berths.

## INSPECTION SURVEYS.

The same five parties as in previous years were engaged the greater part of the season on the inspection of surveys made under contract.

Mr. E. W. Hubbell, D.L.S., was again working in the Prince Albert district. In addition to the inspection of the surveys performed under contract in that district he resurveyed two townships near Prince Albert. During the season he travelled with his outfit over 1,700 miles by rail and over 1,000 miles by trail, not including the number of miles travelled daily to and from work.

Mr. P. R. A. Belanger, D.L.S., carried on inspection in eastern Manitoba. For a considerable part of the time he was engaged on small miscellaneous surveys in Manitoba and Alberta, which he completed to the number of forty-five. He also made a survey of Bender settlement in township 19, range one, west of the principal meridian.

Mr. C. F. Miles, D.L.S., inspected the contract surveys in the district north-west of Battleford. He also made a restoration survey of two townships north of Maple Creek and a resurvey of three townships near Prince Albert.

Mr. G. J. Lonergan, D.L.S., in addition to inspection made miscellaneous resurveys and traverses in ten townships as well as a resurvey of lots 1 to 6 Lac la Biche settlement.

Mr. L. E. Fontaine, D.L.S., inspected contract surveys west of Edmonton and performed a small number of miscellaneous surveys in that district.



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## STATEMENT OF MILEAGE SURVEYED.

The following is a comparison of the mileage surveyed every year since 1908.

NATURE OF SURVEY.	April 1, 1908 to March 31, 1909.	April 1, 1909 to March 31, 1910.	April 1, 1910 to March 31, 1911.
	Miles.	Miles.	Miles.
Township outlines.....	2,019	2,089	2,376
Section lines.....	16,985	16,326	11,849
Traverse.....	3,323	2,413	2,758
Resurvey.....	2,175	3,876	906
Total for season.....	24,502	24,704	17,889
Number of parties.....	67	60	64
Average miles per party.....	366	412	279

The following tables show the mileage surveyed by the parties under daily pay and by the parties under contract.

## WORK OF PARTIES UNDER DAILY PAY.

NATURE OF SURVEY.	April 1, 1908, to March 31, 1909.	April 1, 1909, to March 31, 1910.	April 1, 1910, to March 31, 1911.
	Miles.	Miles.	Miles.
Township outlines.....	512	861	1,178
Section lines.....	1,004	1,066	1,487
Traverse.....	1,158	1,324	462
Resurvey.....	2,175	3,508	835
Total for season.....	4,849	7,059	3,962
Number of parties.....	36	34	30
Average miles per party.....	135	208	132

## WORK OF PARTIES UNDER CONTRACT.

NATURE OF SURVEY.	April 1, 1908, to March 31, 1909.	April 1, 1909, to March 31, 1910.	April 1, 1910, to March 31, 1911.
	Miles.	Miles.	Miles.
Township outlines.....	1,507	1,228	1,198
Section lines.....	15,981	15,260	10,362
Traverse.....	2,165	1,089	2,296
Resurvey.....		68	71
Total for season.....	19,653	17,645	13,927
Number of parties.....	31	26	34
Average miles per party.....	634	679	410

NOTE:—Owing to the nature of their work the parties under Messrs. E. Bartlett, P. R. A. Belanger, G. B. Bemister, E. L. Burgess, J. H. Brownlee, A. J. Campbell, P. C. Coates, C. Engler, L. E. Fontaine, E. W. Hubbell, A. W. Johnson, H. P. Keith, J. A. Kirk, F. H. Kitto, G. J. Lonergan, C. F. Miles, R. D. McCaw, W. Ogilvie, H. G. Phillips, H. B. Proudfoot, W. R. Reilly, H. W. Selby, W. Thibaudeau and G. L. Williams are not included in the statement of mileage for the year ended March 31, 1911.



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## COST OF SURVEYS.

The following statement shows the average cost per mile of surveys executed by surveyors under daily pay and by surveyors under contract:

	Surveyed under daily pay.	Surveyed under contract.
Total mileage surveyed. ....	3,962	13,927
Total cost. ....	\$388,600	\$876,477
Average cost per mile. ....	\$98.08	\$27.03

The high average cost per mile of \$27.03 for contract surveys as compared with \$17.97 for 1909 is due to the fact that all the townships subdivided during 1910 were wooded while of those subdivided in 1909, 169 were open prairie; the relative rates per mile for surveys in open prairie and in solid bush are as \$7.50 to \$31.

The average cost per mile for surveys performed under day pay increased from \$49.33 in 1909 to \$98.44 in 1910. The average per mile for block outline surveys was \$175 as compared with \$167 in 1909. When the party under Mr. B. J. Saunders, D.L.S., is omitted from the calculation the average cost per mile for block outline surveys is found to be about ten dollars per mile lower in 1910 than in 1909. Mr. Saunders was compelled to abandon the survey of the nineteenth base line west of the fourth meridian when only a few miles had been run, but after all the initial expenses of organization, travel, &c., had been incurred. Other factors to increase the average cost of the surveys in 1910 were the larger number of parties working in the foot-hills in Alberta and in the railway belt in British Columbia and the smaller number engaged upon miscellaneous surveys, resurveys and restoration surveys in other parts of Alberta and in Saskatchewan and Manitoba. Owing to the nature of the country surveys in the foot-hills and in British Columbia are much more difficult than in the level and settled districts, and consequently slower and much more expensive. The average cost per mile of surveys in the foot-hills in Alberta during 1910 was \$79, and in British Columbia \$85, while the cost in Saskatchewan and Manitoba and other parts of Alberta was \$33 per mile.

## DESCRIPTIONS OF TOWNSHIPS.

Descriptions of the townships subdivided during the year have been compiled from the surveyors' reports and will be published in a separate volume.

The subdivision surveys performed prior to March 31, 1910, those made between that date and March 31, 1911, and the resurveys executed during the same period are shown in colours upon the map which accompanies this report.

## MANUAL OF SURVEY.

The seventh edition of the Manual of Survey which at the time of the issue of last year's report was in the hands of the printers has since been published and distributed to Dominion Land Surveyors and to the members of the office staff.



## CONFERENCE OF SURVEYORS GENERAL.

At the Colonial Conference held in 1907, the following resolution was adopted:—

“That it is desirable that reciprocity should be established between the respective Governments and examining authorities throughout the Empire with regard to the examination and authorization of land surveyors, and that the memorandum of the Surveyors’ Institution on this subject be commended to the favourable consideration of the several Governments.

At the suggestion of the Surveyors’ Institution, of London, a conference of the Surveyors General of the Colonies was called by the Imperial Government to meet in London on the 24th of October, 1910, to discuss the question of reciprocity in the authorization and examination of surveyors throughout the Empire. By order in council of the 21st July, 1910, I was authorized to attend the Conference and proceeded to London for that purpose. At the last moment it was found that circumstances in connection with the establishment of the Union of South Africa prevented the representation of the Union at the Conference. Moreover, the New Zealand Ministers and the State Governments of Australia expressed the wish that the Conference should be postponed to the next year and it was postponed accordingly.

## CORRESPONDENCE.

The correspondence of this Branch consisted of:

Letters received. . . . .	11,304
Letters sent. . . . .	13,580

## ACCOUNTS.

The Accountant’s record shows:

Number of accounts dealt with. . . . .	876
Amount of accounts. . . . .	\$961,340
Number of cheques forwarded. . . . .	3,298

## OFFICE STAFF.

The office staff of the Topographical Surveys Branch at Ottawa consists of one hundred and twenty-six employees, or an increase of thirteen over last year. A list of the staff is given as Appendix No. 9 of this report.

Eighteen appointments were made to the staff, three employees were transferred to other branches of the Department and two resigned.

The appointments were Messrs. M. T. O’Meara, A. C. Pick, R. C. McCully, J. N. H. Gagnon, E. E. La Bérée, C. S. Jones, C. P. Dubuc, C. H. Cagnat, O. E. Fournier, C. M. Ross, A. H. Beaubien, C. Baril, Jas. Howie, W. A. Purdy, J. H. Brigley, B. J. Roe, J. A. Watson and H. E. Hare. Messrs. A. L. Cumming and G. C. Webb resigned while Mr. A. Paquette was transferred to the Registration Branch, and Messrs. F. H. H. Williamson and B. E. Norrish to the Railway Lands Branch.

## CHIEF DRAUGHTSMAN’S OFFICE.

(*P. B. Symes, Chief Draughtsman.*)

The six sections into which the draughtsmen are divided have continued during the past year on the same lines as before with very little change in the nature of the work or the methods of handling it.

The sketch maps now furnished by surveyors of base lines give valuable information and together with the sketches accompanying progress reports from other surveyors in the field, now made to supply more information than formerly, provide better



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material for mapping the country and arranging for subsequent surveys than was previously available.

The number of township plans compiled and drawn for printing is considerably in excess of the number issued in previous years. This is due chiefly to the greater proficiency attained by the draughtsmen employed, as the number of men available has been about the same as last year ; there are still, however, large arrears to be made up before this part of the work can be brought down to date. We have been unable to continue the issue of topographical plans of the townships owing to the pressure of other work, although a considerable amount of compiling has been done ; one plan covering four townships was printed as an experiment. It is hoped that this very desirable series of plans can be proceeded with before long.

The miscellaneous business, inquiries as to surveys made or proposed, areas, corner monuments, actual or supposed errors in lines, petitions for resurveys, etc., continues to steadily increase.

Details of work in the different sections are given in the reports below by the several heads of sections, and the usual schedule of work executed during the twelve months is added in Appendix No. 5.

## CHIEF DRAUGHTSMAN'S OFFICE.

## FIRST SECTION.

## SURVEY INSTRUCTIONS AND GENERAL INFORMATION.

*(T. E. Brown, Chief of Section.)*

Twenty-one men are employed in this section, the work in general being the preparation of instructions for the surveyors who are engaged in field operations, the care of the office registers, the issuing of preliminary plans, the answering of enquiries from settlers and others and the preparation of the annual report of the Branch.

During the winter months sketches showing previous surveys are compiled for those districts where it is probable that subdivision surveys will be extended during the following season. In addition information is collected as to the nature of the country, Hudson's Bay company's posts, Indian reserves, trails, etc. In March and April as a rule we are notified of the surveyors selected to take charge of parties under daily pay and of those to whom contracts are awarded. Notifications are at once sent out informing each surveyor of the nature and location of his surveys ; detailed instructions are furnished later. During the year one hundred and eighty-two drafts of instructions were prepared involving the compiling of 1,115 sketches, and 35 maps and tracings.

While in the field surveyors are required to furnish to the office sketches showing the progress of their work. Entries in the office registers show that 1,206 progress sketches were received and that surveyors furnished also 466 books of field notes for township surveys, 294 books and 509 plans, sketches, etc., for miscellaneous surveys, 278 timber reports, 123 statutory declarations of settlers and returns for 987 magnetic observations and for 48 timber berths. General reports on their survey operations were received from forty-three surveyors.

Their examination having been completed 772 books of field notes were placed on record together with 273 plans of miscellaneous surveys and 123 statutory declarations.

Plans of 740 townships and of 13 settlements or townsites were received from the lithographic office, entered in the registers and distributed, as well as 84 sectional maps and 184 miscellaneous plans.

Preliminary plans were issued for 347 townships.

Eighteen hundred and twenty-seven communications from settlers and others and inquiries from other branches were received and dealt with ; to do this required the preparation of 2,606 sketches, 99 maps and tracings and the copying of 627 pages of field notes. Thirteen descriptions of parcels of land were drafted.



The compilation of a set of maps to illustrate discrepancies in the surveys and to show closings of township surveys was continued throughout the year ; six new sheets were made and twenty-one revised and brought up to date.

Two thousand four hundred and twenty-five files were received from the Correspondence Branch for use in the work of this Branch. Four thousand eight hundred and thirty-one draft letters and memoranda were written.

Eight hundred copies of the seventh edition of the Manual of Instructions were distributed.

CHIEF DRAUGHTSMAN'S OFFICE.

SECOND SECTION

SURVEYS IN MANITOBA, SASKATCHEWAN AND ALBERTA.

*(T. S. Nash, Chief of Section.)*

The examination of surveys in the Yukon Territory has been added to the work of this section so that now the section has charge of the examination of the survey returns of all Dominion lands except those in the railway belt of British Columbia. The average strength of the staff for the year was twenty-four men.

In connection with subdivision surveys, sketches sent in by surveyors showing the progress of the work in the field are examined to see that the surveys are being made correctly and in accordance with the instructions. These sketches form the basis for the advances made to contractors. During the year, 978 progress sketches were received and examined, 411 having been sent in by surveyors employed by the day, 403 by contractors and 164 by inspectors.

When a surveyor's final returns are received, a cursory examination is made of them to detect any serious discrepancies or omissions, and, if necessary, they are returned to the surveyor for correction. Compiled plans are then made from these returns. Plans of 805 townships were compiled and sent to the draughtsmen to be drawn for reproduction, which number includes the first edition plans of 234 townships. An examination was made of 314 subdivision surveys, 260 township outline surveys and 142 miscellaneous surveys. Compiled plans of 13 miscellaneous surveys were also sent to the draughtsmen, including a plan of McMurray settlement in northern Alberta and a plan of resurvey of St. Albert settlement.

When compiling, a very careful examination of the returns of the new survey is made, and a memorandum of any discrepancies or omissions is sent to the surveyor; 408 such memoranda were sent and 374 replies were received, and the necessary corrections made in the final returns.

Twelve hundred and seventy letters in connection with the year's work were drafted.

On May 25 the work of examining Yukon Territory surveys was transferred from the fifth section, as the staff there was not large enough to attend to this work. The examination of these returns is up to date though the plotting is not, owing to a lack of proper connections and base line surveys. Throughout the year 118 group lot surveys were examined including 47 received the previous year; 21 base line surveys were also examined 8 of which were previously received. Of these, 45 group lots and four base lines were plotted on the Yukon Territory plans.

The question of issuing plans of the Yukon survey for the convenience of the public has been under consideration and it is proposed to undertake this work during the coming year.

The reports of the inspectors of contract surveys are examined and dealt with in this section; a detailed description of the method of inspection was published in the report of last year. Reports on the inspection of 29 contracts were received during the year and 30 contract accounts were prepared and closed.



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The number of odd jobs dealt with by this section is steadily increasing. One hundred and ninety-five requests for information concerning surveys were received from other branches of the Department involving the calculation of 990 areas. Two hundred and twenty-nine plans of road diversions submitted by the provincial governments of Saskatchewan and Alberta were examined.

The plans and notes of 33 timber berths were examined comprising 152 blocks whose boundaries totalled 1,202 miles of survey and whose area is approximately 770 square miles.

Fifty-five plans of right of way of railways were examined, the mileage of which amounted to 1,268 miles. As several of these plans were in duplicate or triplicate the gross mileage of plans examined was 3,016.

## CHIEF DRAUGHTSMAN'S OFFICE.

## THIRD SECTION—DRAWING FOR REPRODUCTION.

(*C. Engler, Chief of Section.*)

The staff of this section, during the past year, has been steadily engaged in the preparation of plans for printing and nothing has interrupted the work. The personnel of the staff is fourteen, one more than last year, as two new appointments were made and one clerk was transferred to the second section.

The work is steadily increasing as may be seen from a comparison of the number of township plans issued during the last four years.

1907-08 plans issued. . . . .	568
1908-09 " " . . . . .	612
1909-10 " " . . . . .	713
1910-11 " " . . . . .	808

Besides township plans many plans of townsites, settlements and other surveys were made as well as work done of a miscellaneous character. The total number of such plans and odd jobs was 231; this includes maps to accompany the report of the Branch, the Astronomical field tables, diagrams showing altitude of Polaris, and plans to accompany orders in council.

The small printing-press is constantly in use printing foot-notes and titles for plans, labels and forms for office use, and many kinds of lettering formerly done by hand.

The method of preparing plans for printing has been fully described in former reports, and no important changes have been introduced during the year. The copying of the plan by means of the tracing frame, the addition of all letters and figures by means of type held in a small tripod, and the addition of all foot-notes, titles, etc., by means of the small printing-press are still followed. An effort is now being made to print such foot-notes and titles directly on the plans instead of printing them on slips of paper which are then pasted to the plans. This, of course, is possible only with the smaller plans as the larger plans cannot be put into the press.

Among the members of the staff of this section are an engraver, a lithographic artist and a mechanical draughtsman. Though not employed by the Department in these capacities their services are made use of when the occasion arises. During the past year the engraver numbered all the technical instruments such as transits, watches, cameras, etc., in the possession of the Branch, the artist has been called upon frequently to design coloured covers for pamphlets issued by the Department, and the mechanical draughtsman makes the drawings of alterations in instruments, etc. Another clerk is an engrosser, and although there is not much necessity for such work, it has occasionally been found useful in adding titles to photographic albums.



CHIEF DRAUGHTSMAN'S OFFICE

FOURTH SECTION—BRITISH COLUMBIA SURVEYS.

(*E. L. Rowan-Legg, Chief of Section.*)

The work of this section has been the examination of surveyors' field notes, subdivision surveys, timber berths, mineral claims and miscellaneous surveys. Township and quarter township plans have been compiled, the latter supplanting the former in greater number each year as the information required to be shown increases. The work of compiling some of these plans is difficult and tedious on account of the number of field notes of both Dominion and Provincial surveys which have to be consulted.

Much time is often taken up replying to requests for information; in many cases a simple question requires a long search through field notes and correspondence on files.

As the number of surveyors engaged on subdivision was double that of the previous year, the work of preparing instructions and making sketches to accompany the same was greatly increased.

In 1909 Mr. A. W. Johnson made a survey of villa lots at Woodhaven in sections 23, 24 and 25, fractional township west of township 39, west of the coast meridian, and a plan of the survey was compiled in this office. Considerable trouble and delay arose in compiling this plan; the returns were only pencil field notes as the surveyor had to undertake other important work before completing his returns of the survey, and a large number of calculations had to be made by the compiler. A plan to accompany a pamphlet on Woodhaven was also made.

Plans of the towns of Yale and Golden were issued during the year.

The staff of this section consists of nine men, which is the same as last year.

The work of this section consisted of:—

Preliminary plans issued. . . . .	56
Township plans compiled. . . . .	113
Townsite plans compiled. . . . .	2
Plans and sketches made. . . . .	312
Returns of township subdivision examined,—	
Books. . . . .	27
Plans. . . . .	31
Returns of miscellaneous surveys examined,—	
Books. . . . .	8
Plans. . . . .	15
Returns of timber berths examined. . . . .	31
Returns of mineral claims examined. . . . .	16
Letters and memoranda written. . . . .	1,064
Return of timber berths made. . . . .	1
Requests for various information dealt with . . . . .	841
Letters of instructions drafted. . . . .	109



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## CHIEF DRAUGHTSMAN'S OFFICE

## FIFTH SECTION—MAPPING.

*(J. Smith—Chief of Section.)*

The staff of this section has been increased from ten to thirteen; but the amount of absence, due to sickness, has been equivalent to the absence of one man the whole year.

The only Yukon work done by this section was the registering of returns of surveys received and the examination and correction of about four hundred photocopies of plans that are filed in the Dawson office. On May 25, 1910, all the Yukon work was transferred to the second section.

The sectional map work is as follows:—

Sectional maps, 3 miles to an inch, reprinted. . . . .	38
Sectional maps, 3 miles to an inch, revised. . . . .	56
Sectional maps, 6 miles to an inch, reprinted. . . . .	46
New tracings, 2 miles to an inch. . . . .	16
Proofs examined. . . . .	45
Letters and memoranda written. . . . .	366
Letters and memoranda received. . . . .	163
Returns of timber berth surveys used in compiling. . . . .	248
Township plans used in compiling. . . . .	568
Plans of railways used in compiling. . . . .	51
Field books of surveys used in compiling. . . . .	215
Plans of surveyed roads used in compiling. . . . .	377
Plans of Indian Reserves used in compiling. . . . .	46
Post-office names and positions checked and compiled. . . . .	758

The following miscellaneous work was also done by this section:

A plan of the subdivision of Woodhaven was plotted and two tracings made, together with a small key-map showing the position of Woodhaven.

A revised and enlarged index map was made as copy for the engraving of a new map which includes the "Peace River Block" and as far north as lake Athabaska.

The work of reproducing A. O. Wheeler's map of part of the Rocky mountains was prepared for the photographer, and a portion of the map of the Selkirk range was traced for the same purpose.

## CHIEF DRAUGHTSMAN'S OFFICE

## SIXTH SECTION—SCIENTIFIC AND TOPOGRAPHICAL WORK.

*(G. B. Dodge, Chief of Section.)*

## CORRESPONDENCE.

Letters received and referred to this section. . . . .	435
Letters of instructions prepared. . . . .	44
Draft letters prepared. . . . .	546
Office memoranda sent. . . . .	278

## LEVELS.

All the surveyors on base lines are required to run levels. Bench-marks are established at intervals not greater than one mile apart. Whenever it is at all possible these bench-marks are cut in the rock, a mark being cut with the cold-chisel. Where rock is not available trees may be used, the trees being blazed and the letters B.M.



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with the number of the bench-mark being cut on the tree. The descriptions of the bench-marks are given and they are referenced by the chainage on the line and the approximate distance north or south. The difference of elevation between successive bench-marks is checked either by a second independent line or by a system of double turning points, these differences of elevation being required to check within 0.2 feet per mile, not a very high grade of accuracy, but probably sufficient for most practical purposes, and it was not considered advisable to ask for too high a standard at the initial stages of the work. Surveyors this past year have been requested to take aneroid readings conjointly with the levels to enable us to obtain approximate data until ties can be made with railway levels. These aneroid readings have not yet been reduced so that no statement can be made of their probable accuracy.

Level returns for 1910 received to date. . . . .	648 miles
Previous levels. . . . .	854 miles
Total levels to date. . . . .	1,502 miles
Total level returns examined and profiles plotted. . . . .	1,304 miles

## MAGNETIC OBSERVATIONS.

The subject of Terrestrial Magnetism has received a great deal of attention within recent years among the civilized countries of the world. Magnetic surveys are being conducted in several countries. The United States have now very complete information over their whole country and are able to publish a fine isogonic map. For some time past we have felt the need of such a map for the district covered by our own work and have received numerous enquiries from others for the same. This office is most advantageously situated to gather this information. Having a large staff of surveyors in the field every year, scattered over a large area, we are able to collect in a short time and at no additional expense a large amount of magnetic information. All surveyors employed by the day are required to take these observations. The magnetic needles now supplied are especially designed for this work and with few exceptions are very sensitive. Through the courtesy of Mr. R. F. Stupart, the Director of the Meteorological Service, the compasses are all tested by the officer in charge of the Magnetic Observatory at Agincourt and the index correction determined. Where the needles are found to be anything but first class, a new compass is furnished the surveyor.

In the reduction of the observations to a common epoch we are very much handicapped by the absence of a magnetic observatory in the territory covered by the observations. Two of the staff of this division were placed at widely separated points in the Northwest this past season taking hourly declination readings for a whole month. These observations were afterwards plotted and compared with the daily photographic trace of the declinometer at Agincourt. Investigation of the results appear to show that the reduction of our declination observations by means of the Agincourt records is well worth the trouble, the precision of the resulting declination being apparently increased about two and one-half times. It is realized, however, that this is really not much more than a makeshift, and that what we require for proper reductions are the records of an observatory in the Northwest. This matter is now under consideration by the Director of the Meteorological Service who states that he may possibly be able to establish one there this coming season.

Declination returns for 1910, received to date. . . . .	987
Previous returns. . . . .	1,104
Total returns to date. . . . .	2,091
Declination observations, 1910, for comparison with Agincourt	908
Dip observations, 1910. . . . .	94
Total force observations, 1910. . . . .	72



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## TRIANGULATION

Owing to an insufficient staff and press of other work, the office computations of the triangulation in the railway belt in British Columbia is entirely in arrears, nothing whatever having been done with it. The office needs the information which the triangulation will give and we are also receiving outside requests for information. A special effort will be made this coming year to get the work up, and we hope to be able to state in our next report that the computations are up to date.

## ASTRONOMICAL WORK.

All the returns of azimuth observations from block surveyors for the year 1909 have been examined and checked.

The latitude observations of Mr. C. Engler, D.L.S., taken at Fort Smith in 1910 have been examined and checked.

The astronomical field tables for twelve months have been computed.

## STAR DIAGRAMS FOR LATITUDE OBSERVATIONS.

Rapid settlement of the country has compelled the abandonment for some years past of the old ideal system of running base lines in blocks across four ranges. In order to keep sufficiently in advance not to retard the subdivision, block surveyors have been required to run the base lines right across between adjacent meridians. There is thus no closing on their work for a distance of perhaps 150 miles or more. The positions of the base lines again are dependent on the meridians. For this reason the new model base line transit has been designed and fitted with accessories for the purpose of taking latitude observations by Talcott's method. Surveyors on meridians will in future be expected to take frequent latitude observations to provide an efficient independent check against any considerable error in chainage. Perhaps the most tedious part of a latitude observation by Talcott's method is the preparation of the observing list, especially when several star catalogues have to be consulted. To facilitate the preparation of these observing lists and save the surveyor's time, star charts were compiled in 1908 and were described in the report for that year. These charts contain stars to the fifth magnitude only. It was found last year that the telescopes on the latest base line transits were sufficiently powerful to observe most stars marked up to the seventh magnitude without difficulty. Our observing lists were, therefore, very much restricted when made from the star charts. The stars had been plotted directly from the different catalogues, that is to say, the positions had not been referred to a common epoch but to the epoch of the catalogue from which they had been taken, so that some stars were plotted for epoch 1890, some for 1900 and some for 1908. It was therefore, decided to entirely replot the charts, reducing all star places to epoch 1910, and embracing all stars up to the seventh magnitude. This has now been completed and the charts have been printed. The charts contain all stars within the desired limits of declination given in the Nautical Almanac, Berliner Jahrbuch, Connaissance des Temps, Star List of American Ephemeris, Greenwich Second Nine-Year Catalogue for 1900, Greenwich second Ten-Year Catalogue for 1890, Ambronn Sternverzeichnis, 1900. There are 6,740 stars in all. We have now in hand the preparation of a star list to be used in conjunction with the star charts. This list will give the mean places for 1910 of all the stars plotted and is intended to take the place of different catalogues.

## TOPOGRAPHICAL WORK.

Topographical plans of 156 townships were compiled.



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## TESTING LABORATORY.

The testing laboratory, the absence of which has prevented the proper testing of surveyors' instruments, is at last under construction and will be finished shortly.

## PHOTOGRAPHIC OFFICE.

(*J. Woodruff, Chief Photographer.*)

The work of the chief photographer has greatly increased. Especially is this noticeable in velox printing in which department 4,770 prints were made. Last year the velox were included in the bromide work, but are now classed separately.

The purchase of a new velox printing machine fitted with a mercury vapour lamp enables one to turn out velox and artura prints expeditiously.

Increases are shown in dry plate developing and in solio printing. Blue prints also show a marked increase. The process of bromide enlarging has been greatly expedited by the installation of a five-tube mercury vapour lamp, by means of which enlargements or lantern transparencies can be made at any time, and not be dependent on the sunlight as hitherto.

Last summer the chief photographer visited Quebec, Father Point and Rimouski, where he obtained negatives of shipping, incoming immigrants, landing of the mails, etc. He also visited many places in the Eastern Townships and took photographs of cattle, farms and farming operations, for the use of the Immigration Branch.

The total of work executed during the year shows an increase of 50 per cent over that of the year previous. The staff is the same as that of last year.

## PHOTOGRAPHIC OFFICE—PROCESS WORK.

(*H. K. Carruthers, Process Photographer.*)

The new frame for hanging copying camera and copying board mentioned in last year's report has given excellent satisfaction and during the past year representatives of outside firms visited the office to inspect this most up-to-date apparatus. Two firms outside the city are copying this camera to use in their photographic studios.

With the removal of the printing department from this office to the Imperial building we will have more room at our disposal and hope in the course of the next two or three months to be able to make our large size negatives of 24" x 32".

We are installing in the basement of the Imperial building the machinery for a photo-engraving plant transferred to us by the Public Works Department and when this is installed, any half-tone and line cuts required for our Branch can be made in this office.

An interesting piece of photo-lithography was started this year, the reproduction in colours of Mr. A. O. Wheeler's map of the main range of the Rocky Mountains with parts of the Dogtooth and Selkirk Mts. This will require the making of about fifty negatives 16" x 18" and a considerably larger number of photo-lithographs. The expense of reproducing this will be less than one-quarter the cost of engraving it on stone.

## BOARD OF EXAMINERS FOR DOMINION LAND SURVEYORS.

(*F. D. Henderson, Secretary.*)

The Board of Examiners for Dominion Land Surveyors held two meetings during the year. The first was a special meeting lasting from April 30 to June 6 (inclusive), 1910, during which examinations were held at Ottawa, Montreal, Toronto, Winnipeg and Vancouver. The second was the regular annual meeting called for by section 9 of the Dominion Lands Surveys Act. It began on Monday, February 13, 1911, and



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lasted until March 30, 1911. During this meeting examinations were held at Ottawa, Halifax, Montreal, Kingston, Toronto, Winnipeg, Calgary, Edmonton and Vancouver. The total number of candidates for examination was 257. Of these 186 tried the preliminary examination as against 362 in 1909-10. Sixty-nine tried the final, and two tried the examination for Dominion Topographical Surveyor. Sixty-four candidates were successful at the preliminary examination as follows :

## PRELIMINARY EXAMINATION.

Alexander, Walter C., Ottawa, Ont.  
 Aslat, Edward K. S., Northminster, Sask.  
 Bolton, Lambert E. B., Wiarton, Ont.  
 Bowman, James Thornley, London, Ont.  
 Bradley, James Dennis, Ottawa, Ont.  
 Brown, Lindsay, O., Ottawa, Ont.  
 Cameron, Max, G., Peterborough, Ont.  
 Chisholm, Kenneth, Gordon, Halifax, N.S.  
 Clark, H. Jackson, Wellington, Ont.  
 Coltham, George, William, Aurora, Ont.  
 Cordukes, John Patrick, Ottawa, Ont.  
 Côté, J. Aurèle, Ottawa, Ont.  
 Cousineau, Aimé, Ottawa, Ont.  
 Dawson, Irvin Harrison, St. Catharines, Ont.  
 Dennis, Thomas Clinton, Ottawa, Ont.  
 Dimock, Clarence Lewis, Upper Newport, N.S.  
 Earle, Henry Arthur, Toronto, Ont.  
 Edgecombe, G. Harold, Ottawa, Ont.  
 Elliott, George Reginald, Goderich, Ont.  
 Ford, John W. H. London, Ont.  
 Fredette, Joseph Frédelin, Ottawa, Ont.  
 Gibson, Colin W. G., Toronto, Ont.  
 Goodman, Hyman Meyer, Toronto, Ont.  
 Gordon, Heber, Leduc, Alta.  
 Gorman, Edwin, Buckingham, P.Q.  
 Haggen, Geoffrey Loosmore, Revelstoke, B.C.  
 Hotchkiss, Cyrus Percival, Edmonton, Alta.  
 Huetner, Alvin, D., Wiarton, Ont.  
 Jarvis, Ralph Hemsworth, Toronto, Ont.  
 Johnson, Hubert Colpoys, Ottawa, Ont.  
 King, Arthur Harry, Edmonton, Alta.  
 Kingston, Kenneth J., Ottawa, Ont.  
 LaBeree, Edwin E., Ottawa, Ont.  
 Macdonald, Alexander Gilmour, Toronto, Ont.  
 Macpherson, Harold Nolan, Kemptville, Ont.  
 Marshall, Joseph A. P., London, Ont.  
 Meikle, Angus Urquhart, Kingston, Ont.  
 Moulton, Hazen Parker, Ottawa, Ont.  
 MacLaurin, James Gladstone, Vankleek Hill, Ont.  
 MacLeod, David Douglas, Parkhill, Ont.  
 McCloskey, Michael D'Arcy, Chelsea, P.Q.  
 McCully, Robert Chesley, Ottawa, Ont.  
 McKay, Robert B., Vancouver, B.C.  
 Norrish, Wilbert Henry, Guelph, Ont.  
 Perron, Hermel Marie, Edmonton, Alta.  
 Prevost, Raoul de M., St. Jerome, P.Q.  
 Ratz, John Earl, Elmira, Ont.  
 Richardson, Colin Esdaile, Toronto, Ont.  
 Roberts, Otto B., Kingston, Ont.  
 Roberts, George Rowland, Winnipeg, Man.  
 Ross, Charles Cathmer, Ottawa, Ont.  
 Sibbett, William Algernon, Bracebridge, Ont.  
 Smith, K. Harold, Harrow, Ont.  
 Smith, Neville Herbert, Ottawa, Ont.  
 Surette, Germain Augustin, West Pubnico, N.S.  
 Vickers, Newell, Renwick, Ont.  
 Von Edeskuty, Joseph Otto, Calgary, Alta.  
 Wadlin, Lorenzo Norette, Ottawa, Ont.  
 Warrington, George Albert, Cornwall, Ont.  
 White, Donald Alexander, Ottawa, Ont.  
 Wight, Edmund James, Ottawa, Ont.  
 Workman, Thomas Oswald, Ottawa, Ont.  
 Wright, James Goldwin, Valleyfield, P.Q.  
 Zinkan, William Edward, Southampton, Ont.

Thirty-eight candidates were successful at the final examination as follows :

## FINAL EXAMINATION.

Bartlett, Ernest, Smithville, Ont.  
 Bennett, George Arthur Eden Ont.  
 Bush, Clayton E., Toronto, Ont.  
 Chartrand Donat Emile, Ottawa, Ont.  
 Chase, Albert Victor, Orillia, Ont.  
 Cowper, George Constable, Welland, Ont.  
 Dawson, Frederick, James, Ashcroft, B.C.  
 Day, Harry Samuel, St. John, N.B.  
 Dennis, William Melbern, Ottawa, Ont.  
 Dillabough, James Vidal, St. Boniface, Man.  
 Eagleson, Francis Merwin, Gorrie, Ont.  
 Evans, Stanley Livingstone, Athens, Ont.  
 Glover, Arthur Edward, Beaverton, Ont.  
 Grassie, Charles Andrew, Welland Ont.  
 Gray, James Edward, Uxbridge, Ont.  
 Heuperman, Frederick Justinus, Calgary, Alta.  
 Hoar, Charles Millard, Ottawa, Ont.  
 Johnston, William James, St. Catharines, Ont.  
 Keith, Homer Pasha, Edmonton, Alta.  
 Lee, Roger Melville, Galt, Ont.  
 Martindale, Ernest Smith, Kingsmill, Ont.  
 Martyn, Oscar William, Mitchell, Ont.  
 Menzies, James Mellon, Ottawa, Ont.  
 Miller, Henry Belfrage, Montreal, P.Q.  
 Murray, Ernest William, Seaforth, Ont.  
 McElhanney, William George, Vancouver, B.C.  
 McMaster, William A. A., Palmerston, Ont.  
 Pearce, Seabury Kains, Calgary, Alta.  
 Pequegnat, Marcel, Berlin, Ont.  
 Powell, William Hall, Little Harbor, N.S.  
 Rainboth, George Louis, Ottawa, Ont.  
 Ransom, John Thomas, Toronto, Ont.  
 Roy, Joseph Emile, Quebec, P.Q.  
 Seibert, Frederick V., Southampton, Ont.  
 Taylor, William Emerson, Owen Sound, Ont.  
 Walker, Claude Melville, Guelph, Ont.  
 White, Walter Russel, Ottawa, Ont.  
 Wilson, Reginald Palisser, Winnipeg, Man.

One candidate, Wilmot Maxwell Tobey, Ottawa, passed the examination for Dominion Topographical Surveyor.



As in former years, the time of the Board at both meetings was largely taken up with the reading and valuation of the candidates' answers, and in the preparation of sets of question papers for the next examination.

In addition to this the evidence submitted by candidates at the final examination, in proof of their eligibility therefor, had to be examined. This evidence consisted of certificates of Provincial Land Surveyors, and of affidavits of service under articles of apprenticeship.

Section 22 of the Dominion Lands Surveys Act provides for a shortening of the term of service from three years to one year for men holding diplomas or certificates from technical colleges; and it is provided that "it shall rest with the Board to decide whether the course of instruction in such college or university meets the requirements of this section."

Applications for admission to the privileges of section 22 are being constantly received. Several such from graduates of Canadian, British, and foreign universities and colleges were considered by the Board, and decisions reached in regard to graduates of these institutions which will guide the Board in dealing with similar applications in future.

Oaths of office and allegiance, and bonds for the sum of one thousand dollars each, as required by section 25 of the Act, were received from, and commissions as Dominion Land Surveyors issued to, thirty-six surveyors.

Every Dominion Land Surveyor is required to be in possession of a subsidiary standard of length (D.L.S. Act Sec. 35). Thirty-eight new standards were issued to surveyors, two, which had changed hands, were re-tested, and fifty-four were sent to the Surveyor General of British Columbia for the use of British Columbia surveyors. A list of surveyors who have been furnished with standard measures up to March 31, 1911, will be found in Appendix No. 10.

The correspondence of the Board was as follows :

Letters received . . . . .	1,705
Letters sent . . . . .	950
Circular letters, pamphlets and parcels sent . . . . .	1,512

#### APPENDICES.

The following schedules and statements are appended :

No. 1. Schedule of surveyors employed and work executed by them from April 1, 1910, to March 31, 1911.

No. 2. Schedule showing for each surveyor employed from April 1, 1910, to March 31, 1911, the number of miles surveyed of township section lines, township outlines, traverses of lakes and rivers and resurvey ; also the cost of the same.

No. 3. List of lots in the Yukon Territory surveys of which have been received from April 1, 1910, to March 31, 1911.

No. 4. List of miscellaneous surveys in the Yukon Territory, returns of which have been received from April 1, 1910, to March 31, 1911.

No. 5. Statement of work executed in the office of the chief draughtsman.

No. 6. List of new editions of sectional maps issued from April 1, 1910, to March 31, 1911.

No. 7. Statement of work executed in the photographic office from April 1, 1910, to March 31, 1911.

No. 8. Statement of work executed in the lithographic office from April 1, 1910, to March 31, 1911.

No. 9. List of employees of the Topographical Surveys Branch at Ottawa giving the name, classification, duties of office and salary of each.

No. 10. List of Dominion Land Surveyors who have been supplied with standard measures.

Nos. 11 to 51. Reports of surveyors employed.



SESSIONAL PAPER No. 25b

## MAPS AND PROFILES.

The following maps and profiles accompany this report:

Map showing subdivision surveys and resurveys made from April 1, 1910, to March 31, 1911.

Maps to accompany reports of surveyors.

Profiles of certain base lines.

I have the honour to be, Sir,

Your obedient servant,

E. DEVILLE,

*Surveyor General.*



# TOPOGRAPHICAL SURVEYS BRANCH

## SCHEDULES AND STATEMENTS

### APPENDIX No. 1.

SCHEDULE of Surveyors employed and work executed by them, from April 1, 1910, to March 31, 1911.

Surveyor.	Address.	Description of Work.
Akins, J. R...	Ottawa, Ont...	Production of the sixth base line across ranges 7, 8 and part of 9; part subdivision of township 24, range 6 and townships 21 and 22, range 9; part resurvey of township 23, range 9 and township 24, range 6, west of the fifth meridian.
Aylsworth, C. F., ...	Madoc, Ont...	Retracement survey in township 13, range 6, townships 13 and 14, range 7 and township 13, range 8, east of the principal meridian; township 20, range 21 and township 29 range 32 west of the principal meridian; townships 30, ranges 1 and 2, townships 27 and 28, range 5 and township 2, range 12 west of the second meridian. Traverse in township 30, range 1, west of the second meridian, and subdivision survey and resurvey in townships 30 and 31, range 31, west of the principal meridian.
Baker, J. C...	Kingston, Ont...	Contract No. 13 of 1910. Subdivision of townships 57, 58, 59 and 60 ranges 26 and 27, west of the third meridian.
Bartlett, E...	Smithville, Ont...	Investigation of squatters' claims in the railway belt of British Columbia in the upper Columbia Valley in the vicinity of Golden.
Belanger, P. R. A...	Ottawa, Ont...	Inspection of part of contract No. 19 of 1909; reinspection of contract No. 33 of 1907, and inspection of mounding in contract No. 6 of 1909.
		Miscellaneous surveys in townships 22, 23 and 24, range 3, townships 22 and 23, range 4, townships 16, ranges 7 and 12 township 1, range 13, east of the principal meridian; townships 15 and 19, range 1, townships 15 and 24, range 2, townships 18 and 19, range 3, township 21, range 4, townships 14 and 22, range 6, township 21, range 7, township 22, range 8, township 30, range 9, townships 15 and 18, range 10, townships 9 and 18, range 11, township 30, range 15, township 32, range 18 and township 34, range 20, west of the principal meridian; townships 31 and 32, range 15, townships 44, 45 and 46, range 16, townships 45 and 46, range 17, township 37, range 19, township 38, range 21 and township 36, range 23 west of the fourth meridian; township 60, range 4, townships 58 and 60, range 5 and township 58, range 6 west of the fifth meridian.
		Survey of Bender settlement in township 19, range 1, west of the principal meridian.



## SESSIONAL PAPER No. 25b

**APPENDIX No. 1—Continued.**

SCHEDULE of Surveyors employed and work executed by them, from April 1, 1910, to March 31, 1911—*Continued.*

Surveyor.	Address.	Description of Work.
Bemister, G. B...	Winnipeg, Man...	Survey of blocks 1, 2 and 3 of timber berth No. 1713 in township 50, range 32, west of the principal meridian, and townships 48, 49 and 50, range 1 and townships 48 and 49, range 2, west of the second meridian.
Blanchet, G. H...	Ottawa, Ont...	Survey in townships 20 and 21, range 29, west of the fifth meridian; townships 21 and 23 range 1, township 23, range 2, township 21, range 6, townships 20, 22 and 23, range 8, township 23, range 9, and townships 21 and 22, range 11, west of the sixth meridian. Traverse in townships 20 and 21, range 29, west of the fifth meridian; township 21, range 1, township 23, range 2, township 21, range 6, and township 23, range 8, west of the sixth meridian. Resurvey in townships 20 and 21, range 29, west of the fifth meridian; township 21, range 1, township 23, range 2, township 21, range 6, township 23, range 8 and township 22, range 11, west of the sixth meridian.
Bridgland, M. P.	Calgary, Alta...	Subdivision of part of the northeast quarter of section 18, township 24, range 1 west of the fifth meridian. Miscellaneous surveys in townships 7 and 8, range 31 and township 13, range 32, west of the principal meridian; townships 5 and 7, range 19, township 5, range 20, township 9, range 23 and township 15, range 26, west of the second meridian; township 12, range 12 and township 18, range 14, west of the third meridian; township 10, range 14, townships 10 and 11, range 19, township 10, range 20, townships 9, ranges 22 and 23 and township 21, range 27 west of the fourth meridian; townships 24 and 31, range 1 and township 24, range 2, west of the fifth meridian. Survey of burial plot for R.N.W.M. Police in township 7, range 29, west of the third meridian. Triangulation surveys in the railway belt of B.C.
Brownlee, J. H...	Vancouver, B.C...	Survey of timber berth No. 529 in township 4, range 28, west of the sixth meridian, and block A in the south half of section 2, township 5, range 5, west of the seventh meridian.
Burgess, E. L...	Ottawa, Ont...	Resurvey and levelling in township 55, range 22, west of the fourth meridian.
Campbell, A. J.	Calgary, Alta...	Examination of land in the New Westminster district for the purpose of classification into fruit land, farming land, grazing land, timber land and worthless land.
Carson, P. A...	Ottawa, Ont...	Miscellaneous resurveys in townships 21 ranges 3 and 4, township 22, range 6, townships 23, ranges 7 and 11, township 27, range 14, township 31, range 16, township 34, range 18, township 45, range 22 and township 46,



## APPENDIX No. 1—Continued.

SCHEDULE of Surveyors employed and work executed by them, from April 1, 1910, to March 31, 1911—Continued.

Surveyor.	Address.	Description of Work.
		range 23 west of the second meridian; townships 43 and 43A, range 2, townships 34 and 43, range 3, township 39, range 4, townships 33 and 49, range 5, township 47, range 16, townships 39 and 40, range 22, townships 37, ranges 23 and 24, townships 37 and 47, range 25, and township 48, range 27, west of the third meridian. Investigation in township 43, range 2, township 33, range 3, township 38, range 4, townships 33 and 50, range 5, and townships 37, ranges 25 and 26, west of the third meridian. Traverse in township 21, range 4, township 34, range 18, townships 37, 38 and 42, range 21, townships 38 and 39, range 22, and township 38, range 23, west of the second meridian; townships 34 and 36, range 2, township 34, range 3, township 33, range 6, township 39, range 14, township 43, range 16 and township 40, range 26, west of the third meridian. Resurvey of "lot 1, group 267" in Red Pheasant Indian reserve in township 41, range 15, west of the third meridian.
Cautley, R. H. . . . .	Edmonton, Alta. . . . .	Contract No. 30 of 1910. Subdivision of townships 55 and 56, range 17, townships 55, ranges 18, 19 and 20, and the north third of townships 54, ranges 17, 18, 19 and 20, west of the fifth meridian.
Chilver, C. A. . . . .	Walkerville, Ont. . . . .	Contract No. 17 of 1910. Subdivision of township 69 range 15, townships 68 and 69, ranges 16 and 17, and township 67, range 18, west of the fourth meridian.
Christie, W. . . . .	Prince Albert, Sask. . . . .	Survey of the eighteenth base line across ranges 1 to 12 and the twentieth base line across ranges 1 to 9 west of the fourth meridian.
Coates, P. C. . . . .	Whaletown, B. C. . . . .	Survey of timber berth No. 356 in townships 23 and 24, range 1, west of the sixth meridian.
Coté, J. L. . . . .	Edmonton, Alta. . . . .	Contract No. 19 of 1910. Subdivision of townships 68 and 69, ranges 21, 22 and 23, west of the fourth meridian.
Cumming, A. L. . . . .	Cornwall, Ont. . . . .	Survey of township 52, range 26, and part survey of townships 49, 50 and 51, range 25 and township 51, range 26, west of the fifth meridian. Traverse in township 50, range 26, townships 49 and 50, range 27, townships 47, 48 and 49 range 28, west of the fifth meridian, and township 47, range 1, west of the sixth meridian.
Davies, T. A. . . . .	Edmonton, Alta. . . . .	Contract No. 24 of 1910. Subdivision of townships 61, 62 and 63, ranges 21 and 22, west of the fourth meridian.



## SESSIONAL PAPER No. 25b

APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them, from April 1, 1910, to March 31, 1911—*Continued.*

Surveyor.	Address.	Description of Work.
Deans, W. J...	Brandon, Man...	Subdivision in townships 25 and 26, ranges 20 and 21, west of the fifth meridian; townships 23 and 24, ranges 7 and 8, and township 22, range 10, west of the sixth meridian. Traverse in townships 25 and 26, range 21, west of the fifth meridian; township 24, range 7, townships 23 and 24, range 8 and township 22, range 10, west of the sixth meridian. Resurvey in townships 25 and 26, range 21, west of the fifth meridian; townships 21 and 22, range 10, west of the sixth meridian.
Dumais, P. T. C...	Hull, Que...	Contract No. 20 of 1910. Subdivision of townships 64, 65 and 66, range 16 and townships 65 and 66, range 17, west of the fourth meridian. Survey of timber berth No. 1243 in townships 45 and 46, range 7, west of the fifth meridian.
Ducker, W. A...	Winnipeg, Man...	Survey of the east outlines of township 40, range 28, townships 38, 39 and 40 range 29, and townships 39 and 40, range 30, and the south outlines of townships 39, ranges 30, 31 and 32, west of the principal meridian.
Engler, C...	Ottawa, Ont...	Survey of the north boundary of Alberta across Slave river; survey of Smith Landing settlement on Slave river.
Fairchild, C. C...	Brantford, Ont...	Contract No. 27 of 1910. Subdivision of townships 63, 64, 65, 66 and part of 62, range 1, and township 65 and the east outlines of townships 67 and 68, range 2, west of the fifth meridian.
Fawcett, A...	Gravenhurst, Ont...	Contract No. 11 of 1910. Subdivision of townships 54, 55, 56 and 57, range 22, townships 57 and 58 and the east outlines of townships of 59 and 60, range 23, west of the third meridian
Findlay, A...	Winnipeg, Man...	Contract No. 28 of 1910. Subdivision of townships 62, 63 and 64, range 2, and townships 62 and 63, range 3, west of the fifth meridian. Survey of blocks 1 and 2 of timber berth No. 1015 situated on the east shore of lake Winnipeg, near Bloodvein bay, Man., and blocks 1 and 2 of timber berth No. 1134, situated on Bloodvein river, Manitoba.
Fontaine, L. E...	Lévis, Que...	Inspection of contracts Nos. 9, 10, 16, 22, 23 and 25 of 1909; reinspection of contract No. 12 and additions to Nos. 18 and 25 of 1908. Miscellaneous resurveys in townships 55 and 56, range 7, townships 54, ranges 8 and 12 and township 52, range 22, west of the fifth meridian.
Francis, J...	Portage la Prairie, Man.	Subdivision surveys in township 45, range 20, townships 44 and 45, range 21, township 49, range 23, townships 48 and 49, range 24, and townships 48 and 50, range 25, west of the fifth meridian.



**APPENDIX No. 1—Continued.**

SCHEDULE of Surveyors employed and work executed by them, from April 1, 1910, to March 31, 1911—*Continued.*

Surveyor.	Address.	Description of Work.
Green, T. D...	Ottawa, Ont. . . . .	Contract No. 34 of 1910. Subdivision of township 31, range 6, townships 29, 31 and 32, range 7, and township 40, ranges 8 and 9, west of the fifth meridian.
Hawkins, A. H. . . . .	Listowel, Ont. . . . .	Survey of the twenty-first base line across ranges 1 to 18, west of the fifth meridian. Miscellaneous surveys in township 29, range 7, and townships 40, ranges 8 and 9, meridian; township 45, range 4, township 48, range 22, and township 51, range 27, west of the fourth meridian. Traverse in township 58, range 11, township 53, range 25, and township 80, range 26 west of the fourth meridian; townships 47 and 52, range 1, west of the fifth meridian.
Heathcott, R. V. . . . .	Edmonton, Alta. . . . .	Contract No. 31 of 1910. Subdivision of townships 54 and 55, range 21, the south two-thirds of township 54, range 22 and the north two-thirds of townships 51, ranges 18, 19, 20, 21, 22 and 23, and survey of the east outlines of townships 56 ranges 21 and 22, west of the fifth meridian.
Holcroft, H. S. . . . .	Toronto, Ont. . . . .	Contract No. 12 of 1910. Subdivision of townships 57, 58 and 59, range 24, and townships 57, 58, 59 and 60, range 25, and survey of the east outline of township 60, range 24, west of the third meridian.
Hopkins, M. W. . . . .	Edmonton, Alta. . . . .	Contract No. 17 of 1910. Subdivision of townships 65 and 66, ranges 1, 2, 3, 4 and 5, and survey of the east outlines of townships 67 and 68, ranges 2, 3, 4, 5 and 6, west of the fourth meridian.
Hubbell, E. W. . . . .	Ottawa, Ont. . . . .	Inspection of contract No. 32 of 1907. Contracts Nos. 13, 17 and part of 19 of 1909. Contracts Nos. 4, 5, 6 and 7 of 1910. Re-survey in township 48, range 21 and township 49, range 27 west of the second meridian. Traverse in townships 42 ranges 9, 10, 13 and 14, townships 52 and 53, ranges 12 and 13, and township 49, range 26 west of the second meridian.
Johnson, A. W. . . . .	Kamloops, B.C. . . . .	Survey of villa lots at Woodhaven on north arm of Burrard Inlet.
Keith, H. P. . . . .	Edmonton, Alta. . . . .	Survey of timber berth No. 1705 in townships 50 and 51, ranges 22 and 23, west of the fifth meridian; timber berth No. 1706 in township 51, range 22, west of the fifth meridian, and of timber berth No. 1707 in township 50, range 23, west of the fifth meridian.
Kimpe, M. . . . .	Edmonton, Alta. . . . .	Contract No. 15 of 1910. Subdivision of townships 49, 50 and 51, range 8, townships 50 and 51, ranges 9 and 10, and part of township 52, range 9, and survey of the east outlines of townships 49, ranges 9, 10 and 11 west of the fifth meridian.



## SESSIONAL PAPER No. 25b

APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them, from April 1, 1910, to March 31, 1911—*Continued.*

Surveyor.	Address.	Description of Work.
Kirk, J. A. . . . .	Revelstoke, B.C. . . .	Survey of timber berth No. 401 in townships 29, ranges 21 and 22, west of the fifth meridian; timber berth No. 415 in townships 30 and 31, range 30, west of the fifth meridian, and of timber berth No. 416 in township 30, range 20 west of the fifth meridian.
Kitto, F. H. . . . .	Ottawa, Ont. . . . .	Miscellaneous resurveys in St. Albert settlement and in townships 53, ranges 25 and 26 west of the fourth meridian.
Knight, R. H. . . . .	Edmonton, Alta. . . .	Contract No. 26 of 1910. Subdivision of townships 65, 66, 67 and 68, range 26, and townships 63, 64, 65, 66, 67 and 68, range 27, west of the fourth meridian.
Lang, J. L. . . . .	Sault Ste. Marie, Ont.	Subdivision in townships 5, 6 and 7, range 4, and townships 7 and 8, range 5, west of the fifth meridian. Resurvey in townships 5, 7 and 8, range 1, township 5, range 2, and townships 6 and 7, range 3, west of the fifth meridian.
Laurie, R. C. . . . .	Battleford, Sask. . . .	Contract No. 35 of 1910. Subdivision of townships 54, 55 and 56, range 23, west of the third meridian.
Lighthall, A. . . . .	Ottawa, Ont. . . . .	Survey in townships 3 and 4, range 3, west of the seventh meridian; townships 18, 21, 40 and 41, east of the coast meridian; township 39, west of the coast meridian. Traverse in township 4, range 3, and township 6, range 7, west of the seventh meridian; townships 40 and 41, east of the coast meridian. Resurvey in townships 3 and 4, range 3, west of the seventh meridian; townships 18, 21, 40 and 41, east of the coast meridian; township 39, west of the coast meridian. Survey of timber berth No. 535 in township 39, west of the coast meridian; timber berth No. 536 in township 40, east of the coast meridian, and timber berth No. 537 in township 6, range 5, west of the seventh meridian.
Lonergan, G. J. . . .	Buckingham, Que. . . .	Inspection of contract No. 26 of 1909, and contracts Nos. 16, 17, 18, 19, 21, 23, 24 and 34 of 1910. Resurvey in township 53, range 3, township 68, range 16, township 54, range 21, township 53, range 23, and townships 54, ranges 27 and 28, west of the fourth meridian. Traverse in township 53, range 3, townships 51, ranges 6 and 7, townships 64 and 65, range 22, townships 52 and 53, range 26, and townships 53 and 54, range 27, west of the fourth meridian. Resurvey of lots 1 to 6, Lac la Biche settlement in township 68, range 16, west of the fourth meridian.
Miles, C. F. . . . .	Toronto, Ont. . . . .	Reinspection of contract No. 8 of 1909, inspection of contracts Nos. 8, 9, 10, 11, 12, 13 and 35 of 1910. Resurvey in township 49, range 24 and townships 48, ranges 27 and 28 west of the second meridian; township 48, range 1, townships 14 and 15, range 25, and



**APPENDIX No. 1—Continued.**

SCHEDULE of Surveyors employed and work executed by them, from April 1, 1910, to March 31, 1911—*Continued.*

Surveyor.	Address.	Description of Work.
		townships 13 and 14, range 30, west of the third meridian; townships 13 and 14, range 1, west of the fourth meridian. Traverse in townships 48 and 49, range 24, and townships 48, ranges 27 and 28, west of the second meridian; township 15, range 25, west of the third meridian; townships 13 and 14, range 1, west of the fourth meridian.
Mitchell, B. F. . . . .	Edmonton, Alta. . . . .	Contract No. 21 of 1910. Subdivision of township 63, range 16, and townships 61, 62, 63 and 64, range 17, west of the fourth meridian.
Montgomery, R. H. . . . .	Prince Albert, Sask. . . . .	Contract No. 5 of 1910. Subdivision of township 51, range 5, townships 51 and 52, range 6, townships 50, 51, 52 and 53, range 7, and townships 49, 50, 51 and 52, range 8, west of the third meridian.
Morrier, J. E. . . . .	Ottawa, Ont. . . . .	Contract No. 4 of 1910. Subdivision of townships 44, ranges 7, 8, 9 and 10, and the northerly two-thirds of township 45, range 3, west of the second meridian.
McCaw, R. D. . . . .	Calgary, Alta. . . . .	Examination of land in the Kamloops district for the purpose of classification into fruit land, farming land, grazing land, timber land and worthless land.
McFarlane, J. B. . . . .	Toronto, Ont. . . . .	Subdivision in townships 39 and 40, range 16, township 39, range 17, township 40, range 18, township 41, range 19, township 44, range 21, townships 45 and 46, range 22, township 46, range 23, and township 50, range 26, west of the fifth meridian.
McFarlane, W. G. . . . .	Toronto, Ont. . . . .	Contract No. 33 of 1910. Subdivision of township 83, range 23, and the parts north of Peace river of townships 83, ranges 21 and 22, and township 82, range 23, survey of the east outlines of townships 84, ranges 22, 23 and 24, all west of the fifth meridian. Subdivision of townships 81 and 82, range 1, townships 81 ranges 2 and 3, township 70, range 9, the west half of township 72 and the northerly two-thirds of the west half of township 71, range 2, the northerly two-thirds of township 70, and the southerly third of townships 71, ranges 7 and 8, and the southerly third of township 71, range 9; survey of the north outline of township 84, range 1, and the east outlines of townships 83 and 84, range 2, and townships 69, ranges 7, 8 and 9, all west of the sixth meridian. Traverse in township 82, range 26, west of the fifth meridian, and in township 71, range 3, west of the sixth meridian. Survey of blocks 1 and 2 of timber berth 1272 in Peace river district, Alberta.
McGrandle, H. . . . .	Wetaskiwin, Alta. . . . .	Contract No. 29 of 1910. Subdivision of townships 52, ranges 13 and 14, township 56, range 15, townships 55 and 56, and the north third of township 54, range 16, west of the fifth meridian.



SESSIONAL PAPER No. 25b

APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them, from April 1, 1910, to March 31, 1911—*Continued.*

Surveyor.	Address.	Description of Work.
McMillan, Geo. . . . .	Ottawa, Ont. . . . .	Survey of the sixteenth base line across ranges 5 to 13, the seventeenth base line across ranges 9 to 14, and the twentieth base line across ranges 13 to 17, west of the sixth meridian.
McNaughton, A. L. . . . .	Cornwall, Ont. . . . .	Subdivision in townships 45 and 46, range 18, townships 46 and 47, range 19, township 47, range 20, townships 48 and 49, range 21, township 49, range 22, and survey of the east outlines of townships 48, ranges 19 and 20, west of the fifth meridian. Survey of timber berth No. 1709 in township 53, range 10, west of the fifth meridian.
Ogilvie, W. . . . .	Ottawa, Ont. . . . .	Survey of a water-power site for the city of Prince Albert, at Cole falls, on Saskatchewan river.
O'Hara, W. F. . . . .	Ottawa, Ont. . . . .	Resurvey in townships 2 ranges 7, 8 and 19, townships 1 and 2, range 20, township 1, range 27, townships 1 and 2, range 29, and township 1, range 30, west of the fourth meridian. Survey in the town of Pincher Creek and of villa lots around Waterton lakes.
Ord, L. R. . . . .	Hamilton, Ont. . . . .	Contract No. 22 of 1910. Subdivision of townships 61, 62, 63, 64 and 65, range 18, west of the fourth meridian.
Phillips, H. G. . . . .	Saskatoon, Sask. . . . .	Resurvey in township 23, range 7, west of the third meridian.
Plunkett, T. H. . . . .	Toronto, Ont. . . . .	Survey in townships 19 and 20, range 5, townships 19, ranges 6 and 7, townships 23, ranges 9 and 10, townships 22 and 23 range 11, township 23, range 12, townships 21, 22 and 23, range 13, townships 22 and 23, range 25. Traverse in townships 19 and 20, range 5, and townships 21, 22 and 23, range 13, west of the sixth meridian. Resurvey in township 23, range 10, townships 22 and 23, range 11, township 23, range 12, townships 21 and 23, range 13, townships 21, ranges 14 and 24, and townships 22 and 23, range 25, west of the sixth meridian.
Ponton, A. W. . . . .	Edmonton, Alta. . . . .	Survey of the fifth meridian from the northeast corner of township 106 to the northeast corner of township 112; survey of the twenty-eighth base line across ranges 1 to 17, the twenty-ninth base line across range 1, part subdivision of township 109, range 10, west of the fifth meridian, and the production of the principal meridian across lake Winnipeg from the northeast corner of section 12, township 35, to the northeast corner of township 48.
Proudfoot, H. B. . . . .	Saskatoon, Sask. . . . .	Survey of block 24 of timber berth No. 1048 near Green lake, berth No. 1050 on the shores of Namew lake, Goose lake and Amisk lake, blocks 1 and 2 of berth No. 1237 northeast of Hudson Bay Junction and berth No. 1672 in township 43, range 27, west of the principal meridian.



**APPENDIX No. 1—Continued.**

SCHEDULE of Surveyors employed and work executed by them, from April 1, 1910, to March 31, 1911—*Continued.*

Description of Work.	Surveyor.	Address.
Reilly, W. R. . . . . Regina, Sask. . . . .	Traverse of Swan lake in township 10, range 8, west of the second meridian.	
Robinson, E. W. . . . . Ottawa, Ont. . . . .	Survey of the eighth base line across ranges 1 to 5, east of the principal meridian; survey of the principal meridian from the eighth base line to lake Winnipeg; survey of the ninth base line across ranges 1 to 7, west of the principal meridian; survey of the fifteenth base line from the northeast corner of section 35, range 21, west of the principal meridian to the second meridian; survey of the second meridian from the fifteenth base line to the northeast corner of township 61.	
Rolfson, O. . . . . Walkerville, Ont. . . . .	Subdivision in townships 43 and 44, range 20, and township 44, range 21, west of the fifth meridian.	
Ross, J. E. . . . . Kamloops, B.C. . . . .	Survey in townships 19, ranges 13 and 14, township 22, range 17, townships 17, 18, 19, 21 and 22, range 18, townships 21 and 22, range 19, townships 21, 22, 23 and 24 range 20, townships 19, 22, 23 and 24, range 21, townships 19, 20, 22 and 23, range 22, and township 20, range 23, west of the sixth meridian. Traverse in township 22, range 17, townships 18, 19 and 22, range 18, township 21, range 19, township 22, range 20, and townships 22, 23 and 24, range 21, west of sixth meridian. Resurvey in township 22, range 17, townships 18, 20 and 21, range 18, townships 20 and 21, range 19, township 24, range 21, and township 22, range 22, west of the sixth meridian.	
Roy, G. P. . . . . Quebec, Que. . . . .	Contract No. 8 of 1910. Subdivision of townships 53, 54 and 55, range 17, and townships 53, 54, 55 and 56, range 18; survey of the east outline of township 56, range 17, west of the third meridian.	
Saint Cyr, A. . . . . Ottawa, Ont. . . . .	Survey of the third meridian from the northeast corner of township 60 to the northeast corner of township 64, and the seventeenth base line across ranges 1 to 12, west of the third meridian.	
Saunders, B. J. . . . . Edmonton, Alta. . . . .	Survey of the nineteenth base line across ranges 1 to 5, west of the fourth meridian.	
Scott, W. A. . . . . Galt, Ont. . . . .	Surveys in township 10, range 30, west of the fourth meridian; township 10, range 1, townships 11 and 13, range 2, township 8, range 3, and townships 10, 11 and 12, range 4, west of the fifth meridian. Resurvey in township 28, range 12, and township 16, range 13, west of the third meridian. Traverse in townships 27, ranges 17 and 18, west of the second meridian, and in townships 10 and 11, range 3, west of the fifth meridian. Survey of the north boundary of Peigan timber limit in township 9, range 30, west of the fourth meridian. Investigation in township 7, range 10 west of the second meridian.	



SESSIONAL PAPER No. 25b

**APPENDIX No. 1—Continued.**

SCHEDULE of Surveyors employed and work executed by them, from April 1, 1910, to March 31, 1911—*Continued.*

Surveyor.	Address.	Description of work.
Selby, H. W. . . . .	(Died Aug., 1910) . . .	Settlement surveys at Athabaska Landing and McMurray. Traverse of part of Athabaska river from McMurray to McKay.
Seymour, H. L. . . .	Edmonton, Alta. . . .	Contract No. 23 of 1910. Subdivision of townships 61, 62 and 63, ranges 19 and 20, west of the fourth meridian.
Smith, D. A. . . . .	Claude, Ont. . . . .	Survey in township 25 range 20, west of the fifth meridian; townships 24, 25 and 26, range 7, and townships 25 and 26, range 8, west of the sixth meridian. Traverse in townships 25, ranges 7 and 8, west of the sixth meridian. Resurvey in township 25, range 20, west of the fifth meridian.
Smith, J. H. . . . .	Edmonton, Alta. . . .	Contract No. 32 of 1910. Subdivision of township 77, range 19, township 76, and the north third of township 75, ranges 20 and 21, and townships 76 and 77, and the north third of township 75, ranges 22 and 23, west of the fifth meridian.
Steele, I. J. . . . .	Ottawa, Ont. . . . .	Contract No. 25 of 1910. Subdivision of townships 64, 65, 66, 67 and 68, range 25, and township 64, range 26, west of the fourth meridian.
Stewart, L. D. N. ....	Collingwood, Ont. ....	Survey in townships 22 and 23, ranges 9 and 10, west of the sixth meridian. Traverse in township 23, range 9, and townships 22 and 23, range 10, west of the sixth meridian. Resurvey in township 23, range 9, west of the sixth meridian.
Stewart, W. M. . . . .	Saskatoon, Sask. . . .	Contract No. 9 of 1910. Subdivision of townships 54, 55, 56 and 57, range 19, and townships 57, ranges 20 and 21, west of the third meridian.
Stock, J. J. . . . .	Ottawa, Ont. . . . .	Contract No. 10 of 1910. Subdivision of townships 54, 55 and 56, ranges 20 and 21, west of the third meridian.
Street, P. B. . . . .	Toronto, Ont. . . . .	Survey in township 27, range 21, and townships 27 and 28, range 22, west of the fifth meridian; townships 22 and 23, range 1, townships 22, 23 and 24, range 2, and townships 26, ranges 7 and 8, west of the sixth meridian. Traverse in township 22, range 1, townships 22 and 24, range 2 and townships 26, ranges 7 and 8, west of the sixth meridian. Resurvey in townships 27, ranges 21 and 22, west of the fifth meridian; townships 22 and 23, range 1, and townships 26, ranges 7 and 8, west of the sixth meridian.
Teasdale, C. M. . . . .	Concord, Ont. . . . .	Contract No. 3 of 1910. Subdivision of townships 44, 46, 47, 48 and the north third of 45, range 11, west of the second meridian.
Thibaudeau, W. . . .	Montreal, Que. . . .	Reconnaissance survey of Winnipeg and English rivers to determine the most suitable locations for storage reservoirs.



**APPENDIX No. 1.—Concluded.**

SCHEDULE of Surveyors employed and work executed by them, from April 1, 1910, to March 31, 1911.—*Concluded.*

Surveyor.	Address.	Description of work.
Tyrrell, J. W. . . . .	Hamilton, Ont. . . . .	Contract No. 2 of 1910. Subdivision of townships 26, 27, 29 and 30, range 1, townships 26, 27, 28, 29 and 30, range 2, and townships 26, ranges 3 and 4, east of the principal meridian.
Waddell, W. H. . . . .	Edmonton, Alta. . . . .	Contract No. 16 of 1910. Subdivision of townships 65 and the south two-thirds of townships 66, ranges 10, 11 and 12, and townships 69, ranges 13 and 14, west of the fourth meridian. Survey of timber berth No. 1305 in townships 60 and 61, ranges 11 and 12, west of the fifth meridian.
Waldron, J. . . . .	Moosejaw, Sask. . . . .	Contract No. 18 of 1910. Subdivision of townships 68 and 69, ranges 18, 19 and 20, west of the fourth meridian.
Wallace, J. N. . . . .	Calgary, Alta. . . . .	Survey of the fourth meridian from the northeast corner of township 80 to the northeast corner of section 13, township 95.
Warren, Jas. . . . .	Walkerton, Ont. . . . .	Contract No. 7 of 1910. Subdivision of townships 52 and 53, range 14, township 53, range 15, and townships 53 and 54, range 16, west of the third meridian.
Watt, G. H. . . . .	Ottawa, Ont. . . . .	Contract No. 6 of 1910. Subdivision of townships 48 and 49, range 10, township 49, range 11, townships 50 and 51, ranges 12 and 13, and survey of the east boundary of township 52, range 12, west of the third meridian.
Williams, G. L. . . . .	Enderby, B.C. . . . .	Survey of blocks 4 and 5 of timber berth No. 253, near Revelstoke, B.C.
Woods, J. E. . . . .	Pincher Creek, Alta. . . . .	Traverse of Southfork river in township 6, range 3, west of the fifth meridian.



SESSIONAL PAPER No. 25b

## APPENDIX No. 2.

SCHEDULE showing for each surveyor employed from April 1, 1910, to March 31, 1911, the number of miles surveyed of township section lines, township outlines, traverses of lakes and rivers and resurvey, also the cost of the same.

Surveyor.	Miles of Section Lines.	Miles of Outlines.	Miles of Traverse.	Miles of Resurvey.	Total Mileage.	Total Cost.	Cost per Mile.	By Day Work or by Contract.
						\$	\$	
Akins, J. R.	82	18	9	11	120	8,662	72 19	Day.
Aylsworth, C. F.	26		1	185	212	9,652	45 53	"
Baker, J. C.	362	45	122		529	13,911	26 29	Contract.
Blanchet, G. H.	87		18	32	137	13,649	99 63	Day.
Bridgland, M. P.			23	31	54	1,378	25 52	"
Carson, P. A.			40	123	163	4,302	26 39	"
Cautley, R. H.	328	61		11	400	12,533	31 33	Contract.
Chilver, C. A.	281	18	62		361	9,830	27 23	"
Christie, W.		126			126	14,414	114 40	Day.
Côté, J. L.	272	18	63		353	9,883	28 00	Contract.
Cumming, A. L.	126	22	109		257	13,230	51 48	Day.
Davies, T. A.	286	30	36	3	355	10,171	28 65	Contract.
Deans, W. J.	100		31	31	162	10,802	66 68	Day.
Ducker, W. A.	17	32			49	4,785	97 65	"
Dumais, P. T. C.	234		132		366	8,487	23 19	Contract.
Fairchild, C. C.	257	44	64	9	374	10,458	27 96	"
Fawcett, A.	288	30	71		389	10,148	26 09	"
Findlay, A.	247	18	47		312	8,587	27 52	"
Francis J.	106	21	30		157	11,037	70 30	Day.
Green, T. D.	278		46		324	9,045	27 91	Contract.
Hawkins, A. H.		109	13	25	147	14,519	98 77	Day.
Heathcott, R. V.	327	58	41		426	12,824	30 10	Contract.
Holcroft, H. S.	301	51	144		496	12,455	25 11	"
Hopkins, M. W.	466	117	62		645	17,107	26 52	"
Kimpe, M.	363	54	80		497	13,861	27 89	"
Knight, R. H.	290	36	60		386	10,653	27 60	"
Lang, J. L.	51	2	3	33	89	7,807	87 72	Day.
Laurie, R. C.	146	18	51		215	5,222	24 29	Contract.
Lighthall, A.	47		18	9	74	9,237	124 82	Day.
Mitchell, B. F.	247	24	71		342	9,073	26 53	Contract.
Montgomery, R. H.	480	50	197		727	18,140	24 95	"
Morrier, J. E.	202		65		267	6,788	25 42	"
McFarlane, J. B.	90	47	17	3	157	13,333	84 92	Day.
McFarlane, W. G.	537	99	91	48	775	18,224	23 51	Contract.
McGrandle, H.	252	9	2		263	7,933	30 16	Contract.
McMillan, Geo.		114			114	28,472	249 75	Day.
McNaughton, A. L.	93	40	11		144	14,152	98 28	"
O'Hara, W. F.	24		10	237	271	8,015	29 58	"
Ord, L. R.	234		88		322	7,780	24 16	Contract.
Plunkett, T. H.	113		25	32	170	12,063	70 96	Day.
Ponton, A. W.	4	225		2	231	28,625	123 92	"
Robinson, E. W.	14	199		1	214	22,186	103 67	"
Rolfson, O.	63	14	25	4	106	13,350	125 94	"
Ross, J. E.	146		22	6	174	10,568	60 74	"
Roy, G. P.	326	38	53		422	12,522	29 67	Contract.
Saint Cyr, A.	22	85			107	26,833	250 77	Day.
Saunders, B. J.		30			30	23,160	772 00	"
Scott, W. A.	61	6	7	29	103	7,677	74 53	"
Seymour, H. L.	288	30	50		368	10,345	28 11	Contract.
Smith, D. A.	70		6	16	92	10,218	111 06	Day.
Smith, J. H.	392	58	55		505	14,500	28 71	Contract.
Steele, I. J.	276	12	87		375	9,544	25 45	"
Stewart, L. D. N.	69		13	9	91	9,915	108 96	Day.
Stewart, W. M.	288	54	15		357	10,866	30 44	Contract.
Stock, J. J.	286	36	24		346	10,056	29 07	"
Street, P. B.	76		19	16	111	9,283	83 63	Day.



APPENDIX No. 2.—*Concluded.*

SCHEDULE showing for each surveyor employed from April 1, 1910, to March 31, 1911, the number of miles surveyed of township section lines, township outlines, traverses of lakes and rivers and resurvey, also the cost of the same.—*Concluded*

Surveyor.	Miles of Section Lines.	Miles of Outlines.	Miles of Traverse.	Miles of Resurvey.	Total Mileage.	Total Cost.	Cost per Mile.	By Day Work or by Contract.
						\$	\$ cts.	
Teasdale, C. M. ....	202	18	14	.....	234	7,042	30 10	Contract.
Tyrrell, J. W. ....	468	44	46	.....	558	15,528	27 83	"
Waddell, W. H. ....	326	48	196	.....	570	13,345	23 41	"
Waldron, J. ....	273	18	71	.....	362	9,971	27 55	"
Wallace, J. N. ....	.....	88	.....	.....	88	27,065	307 56	Day.
Warren, Jas. ....	214	32	24	.....	270	7,687	28 47	Contract.
Watt, G. H. ....	345	30	61	.....	436	11,958	27 43	"
Woods, J. E. ....	.....	.....	12	.....	12	211	17 58	Day.
Total. ....	11,849	2,376	2,758	906	17,889	765,077		



## SESSIONAL PAPER No. 25b

## APPENDIX No. 3.

LIST of lots in the Yukon Territory, survey returns of which have been received from April 1, 1910, to March 31, 1911.  
GROUP No. 1.

Lot No.	Aces.	Surveyor.	Year of Survey.	Date of Approval.	Claimant.	Remarks.
45	346.86	U. S. W. Barwell.....	1909.....	Dec. 12, 1910....	Northern Light, Power and Coal Co.	Right of way for Transmission Line.
GROUP No. 2.						
14	18.86	James Gibbon.....	1910.....	May 26, 1910....	N. A. T. and T. Co.....	Surface Resurvey.
25	5.00	"	1910.....	Nov. 25, 1910....	W. E. Sprague.....	Surface Block 35.
381	50.4	"	1907.....	Nov. 25, 1910....	E. Nichol et al.....	"Oro" Mineral Claim.
382	44.5	"	1907.....	Nov. 25, 1910....	E. Nichol et al.....	"Bernice" Mineral Claim.
390	51.65	"	1908.....	Feb. 23, 1911....	Agnes J. Kinsey.....	"Clara" "
419	43.56	"	1909.....	July 15, 1910....	Jas. J. Lloyd.....	"Sunrise" "
439	51.64	"	1909.....	Nov. 25, 1910....	Jas. Cameron et al.....	"Hunker" "
440	51.65	"	1909.....	Feb. 23, 1911....	Malcolm John Campbell et al.	"Kitchener" "
441	40.7	"	1909.....	Feb. 23, 1911....	Malcolm John Campbell et al.	"Roberts" "
447	36.5	"	1909.....	Feb. 23, 1911....	Jas. Cameron et al.....	"Summit" "
448	47.74	"	1910.....	Nov. 25, 1910....	Chas. Launder et al.....	"Rattler" "
449	32.83	"	1909.....	Nov. 25, 1910....	Jas. Cameron et al.....	"Le Roy" "
453	38.58	"	1909.....	Nov. 25, 1910....	James Caperton.....	"Florodora" "
454	41.32	"	1909.....	June 2, 1910.....	Malcolm John Campbell et al.	"Eureka" "
455	44.23	"	1909.....	Nov. 25, 1910....	Otto F. Kastner.....	"Dawson" "
459	51.65	"	1909.....	Nov. 25, 1910....	James Cameron et al.....	"Calumet" "
460	42.7	"	1909.....	June 6, 1910....	F. H. Elliott.....	"Welcome" "
465	35.2	"	1909.....	June 6, 1910....	James Richard Irvine.....	"Dundas" "
466	42.53	"	1909.....	Feb. 23, 1911....	Chas. Launder et al.....	"Eclipse" "
467	19.38	"	1909.....	Nov. 25, 1910....	Robert Greaves et al.....	"Franklin" "
476	11.35	"	1909.....	Nov. 25, 1910....	Malcolm John Campbell.....	"Golden Age" "
477	51.56	"	1910.....	Nov. 25, 1910....	W. O. Smith.....	"Gold Run" "
478	29.8	"	1910.....	Feb. 23, 1911....	H. H. Honnon et al.....	"Kenwood" "
479	5.1	"	1910.....	Dec. 21, 1910....	Joseph Albert Segher.....	"Mary" Fractional Mineral.
480	9.3	"	1910.....	Dec. 21, 1910....	Joseph Albert Segher.....	"Rebecca" "
481	31.1	"	1910.....	Feb. 23, 1911....	H. H. Honnon et al.....	"Silver Knight" Mineral Claim.
482	32.7	"	1910.....	Feb. 23, 1911....	H. H. Honnon et al.....	"Tiger No. 2" "
483	44.9	"	1910.....	Nov. 25, 1910....	Joseph Albert Segher.....	"Broken Hill" "
484	69.2	"	1910.....	Nov. 25, 1910....	Joseph Albert Segher.....	"Right of Way" "
503	36.69	N. A. Burwash.....	1909.....	June 15, 1910....	J. H. McConnell.....	"Primrose" "
504	27.53	"	1909.....	Nov. 25, 1910....	Jane S. Orrell et al.....	"Review" "



## APPENDIX No. 3—Continued

List of lots in the Yukon Territory, survey returns of which have been received from April 1, 1910 to March, 31, 1911—Continued.

## GROUP No. 2—Continued.

Lot. No.	Acres.	Surveyor.	Year of Survey.	Date of Approval.	Claimant.	Remarks.
505	44.44	"	1909	June 10, 1910.	Jane S. Orrell et al.	"Central" Mineral Claim.
506	50.34	"	1909	June 10, 1910.	Jane S. Orrell et al.	"Yellow Jacket"
507	47.74	N. A. Burwash.	1909	June 10, 1910.	James Lloyd et al.	"Exchange"
508	51.65	"	1909	June 10, 1910.	"	"Rosaline"
510	43.76	"	1909	June 10, 1910.	M. Campbell.	"Empire"
511	51.65	"	1909	June 10, 1910.	A. A. Knorr.	"Pearless"
512	32.90	"	1909	June 10, 1910.	G. H. Lawrence et al.	"Mountain Maid"
513	50.16	"	1909	Nov. 25, 1910.	D. R. Marshall.	"Maple Leaf"
514	35.95	"	1909	June 10, 1910.	David Bauer.	"Pacific"
515	26.00	"	1909	June 10, 1910.	Jane S. Orrell et al.	"Tiger"
516	51.65	"	1909	June 10, 1910.	J. J. Lloyd et al.	"B. C."
517	50.71	"	1909	May 31, 1910.	"	"Deadwood"
518	51.65	"	1909	May 31, 1910.	"	"Doloris"
519	48.57	"	1909	May 31, 1910.	"	"O. K."
520	25.03	"	1909	June 10, 1910.	Joseph Fournier.	"Belle classe"
521	17.19	"	1909	June 10, 1910.	Louis Martin et al.	"Chicoutimi"

## GROUP No. 5.

163	50.29	H. G. Dickson.	1909	Nov. 25, 1910.	D. C. Campbell.	"Bell" Mineral Claim.
164	49.28	"	1909	Nov. 25, 1910.	Dan Gilles.	"Little May" Mineral Claim.
165	44.03	"	1909	Nov. 25, 1910.	R. Unsworth.	"Caroline"
166	10.68	"	1909	Nov. 25, 1910.	Gilbert Fowler.	"Black Diamond"
167	83.72	"	1909	Aug. 7, 1910.	A. B. Palmer.	"Palmer No. 1"
168	39.10	"	1909	Aug. 7, 1910.	"	"Skookum"
169	29.02	"	1910	Aug. 7, 1910.	Ernest Burwash.	"Ruby"
172	51.59	"	1910	Nov. 29, 1910.	C. H. Johnston.	"Grafter Annex"
189	51.21	N. A. Burwash.	1910	June 10, 1910.	L. V. Wilson.	"Everett"
197	155.67	"	1909	June 10, 1910.	H. K. Burwash.	"Real Thing"
198	47.03	"	1910.	June 10, 1910.	D. Ross.	"Rothsay"



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## GROUP NO. 6.

60	9-82	H. G. Dickson	1909	Nov. 25, 1910	W. S. McGee	"Blue Grouse" Mineral Claim.
104	51-65	"	1909	Nov. 25, 1910	H. E. Porter	"Empire" "
105	160-00	"	1909	Nov. 25, 1910	"	Surface lot. " Mineral Claim.
106	34-63	"	1909	Nov. 25, 1910	"	"Excelsior" "
107	51-65	"	1909	Nov. 25, 1910	"	"Porter" "
109	51-65	"	1909	Nov. 25, 1910	Edward A. Dixon	"Evening" "
110	50-19	"	1909	Nov. 25, 1910	T. H. Kerrish	"Little Jack" "
111	45-91	"	1909	July 7, 1910	Samuel E. Chambers	"Shamrock" "
112	51-65	"	1910	Nov. 25, 1910	H. W. Vance	"North Star" "
113	51-53	"	1910	.....	"	"Lucky Ell" "
114	51-22	"	1910	.....	Elvin J. Edwards	"Venus No. 3" "

## GROUP No. 10.

18	47-37	H. G. Dickson	1910	.....	Angus S. Fraser	"Remy" Mineral Claim.
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## APPENDIX No. 4.

LIST of miscellaneous surveys in the Yukon Territory, returns of which have been received from April 1, 1910, to March 31, 1911.

Year.	Surveyor.	Description of Survey.
1910....	H. G. Dickson....	Reference traverse from Carmack up Nordenskiöld valley.
1906....	James Gibbon....	Base line on Guysboro gulch, a tributary of Klondike river.
1906....	"	" " on Belcher " " " "
1906....	"	" " on Rabbit " " " "
1906....	"	" " on Twenty " " Hunker Creek.
1906....	"	" " on Twenty-one " " " "
1906....	"	" " on Hattie " " " "
1906....	"	" " on Thirty-seven " " " "
1907....	"	Base and side lines on part of Sixtymile river, a tributary of Yukon river.
1907....	"	" " " " on Bedrock creek, a tributary of Sixtymile river.
1907....	"	" " " " on Big Gold creek, a tributary of Sixtymile river.
1907....	"	" " " " on Glacier creek, a tributary of Big Gold creek.
1910....	C. W. MacPherson	Base line on Goring gulch, a tributary of Klondike river.



## APPENDIX No. 5.

## STATEMENT of work executed in the office of the Chief Draughtsman:—

Letters of instructions to surveyors. . . . .	335
Progress sketches received and filed. . . . .	1,206
Declarations of settlers received and filed. . . . .	123
Returns of timber berths received. . . . .	48
Plans received from surveyors. . . . .	509
Field books received from surveyors. . . . .	760
Timber reports received. . . . .	278
Observations for magnetic declination received. . . . .	987
Dip observations received. . . . .	94
Total force observations received. . . . .	72
Preliminary township plans prepared. . . . .	355
Sketches made. . . . .	4,033
Maps and tracings made. . . . .	134
Plans of Yukon lots received. . . . .	71
Plans of miscellaneous Yukon surveys received. . . . .	13
Yukon lots reduced to 40 chains to 1 inch and plotted on group plans. . . . .	45
Returns of surveys examined—	
Township subdivision. . . . .	372
Township outline. . . . .	260
Road plans. . . . .	229
Railway plans. . . . .	55
Yukon lots. . . . .	118
Miscellaneous Yukon surveys. . . . .	21
Mineral claims . . . . .	16
Timber berths. . . . .	64
Correction and other miscellaneous surveys. . . . .	165
Township plans compiled. . . . .	918
Topographical township plans compiled . . . . .	156
Townsite, settlement and other plans compiled. . . . .	15
Proofs of plans examined. . . . .	108
Township plans printed. . . . .	740
Townsite and settlement plans printed. . . . .	13
Miscellaneous plans printed. . . . .	197
Descriptions written. . . . .	13
Pages of field notes copied. . . . .	627
Applications for various information dealt with. . . . .	2,863
Files received and returned. . . . .	2,469
Letters and memoranda drafted. . . . .	8,355
Books received from Record Office and used in connection with office work. . . . .	4,969
Books returned to Record Office. . . . .	4,869
Plans other than printed township plans received from Record Office and used in connection with office work..	654
Plans returned to Record Office. . . . .	673



APPENDIX No. 5.—*Concluded.*

Volumes of plans received from Record Office and used in connection with office work. . . . .	92
Volumes of plans returned to Record Office. . . . .	85
Books sent to Record Office to be placed on record. . . . .	772
Plans other than township plans sent to Record Office to be placed on record. . . . .	273
Sectional maps (3 miles to 1 inch)—	
Revised. . . . .	56
Reprinted. . . . .	38
Sectional maps (6 miles to 1 inch)—	
Reprinted. . . . .	46



SESSIONAL PAPER No. 25b

## APPENDIX No. 6.

LIST of new editions of Sectional Maps issued from April 1, 1910, to March 31, 1911.  
SCALE 3 MILES TO ONE INCH.

No.	Name.	No.	Name.	No.	Name.	No.	Name.
15	Lethbridge.	115	Blackfoot.	172	Fairford.	313	Brulé.
16	Milk River.	116	Rainy Hills.	215	Red Deer.	314	St. Ann.
17	Cypress.	117	Red Deer Forks.	217	Tramping Lake.	315	Edmonton.
19	Willowbunch.	118	Rush Lake.	218	Saskatoon.	317	Fort Pitt.
20	Souris.	162	Seymour.	219	Humboldt.	364	Fort Assiniboine.
66	Medicine Hat.	164	Morley.	220	Nut Mt.	365	Victoria.
67	Maple Creek.	166	Sounding Creek.	263	Jasper.	415	Tawatinaw.
69	Moosejaw.	167	Bad Hills.	265	Peace Hills.	416	La Biche.
73	Winnipeg.	168	The Elbow.	267	Battleford.		
113	Spillimacheen.	171	Duck Mt.	269	Carlton.		

## SCALE 6 MILES TO ONE INCH.

No.	Name.	No.	Name.	No.	Name.	No.	Name.
14	Pincer Creek.	74	Cross Lake.	168	The Elbow.	313	Brulé.
15	Lethbridge.	113	Spillimacheen.	171	Duck Mt.	314	St. Ann.
16	Milk River.	115	Blackfoot.	172	Fairford.	315	Edmonton.
17	Cypress.	116	Rainy Hills.	215	Red Deer.	316	Vermilion.
19	Willowbunch.	117	Red Deer Forks.	216	Sullivan Lake.	317	Fort Pitt.
22	Dufferin.	120	Qu'Appelle.	217	Tramping Lake.	364	Fort Assiniboine.
66	Medicine Hat.	164	Morley.	220	Nut Mt.	365	Victoria.
67	Maple Creek.	165	Rosebud.	263	Jasper.	415	Tawatinaw.
68	Swiftcurrent.	166	Sounding Creek.	264	Brazeau.	416	La Biche.
73	Winnipeg.	167	Bad Hills.	265	Peace Hills.		



## APPENDIX No. 7.

STATEMENT of work executed in the Photographic Office from April 1, 1910, to March 31, 1911.

—	3½ x 3½	3½ x 5½	5 x 7	8 x 10	10 x 12	11 x 14	16 x 18	18 x 20	20 x 24	24 x 30	30 x 36	36 x 42	42 x 48	—
Dry plate negatives.....														1,540
Bromide prints.....		830	684	2		24								471
Solito prints.....		13	35	29	31	45	120	67	26	20	46	37	2	6,802
Velox prints.....		1,923	4,373	473	1	32								4,770
Artura prints.....		3,438	1,256			76								1,867
Vandyke prints.....			1,595	228		44								
Blue prints.....			43	9	10	113	73	186	121	50	51	79	14	749
Lantern transparencies.....				4	32	17	34	51	66	125	18	58	21	426
Photographs mounted.....	465						59							465
Wet plate negatives.....		495	282	60			986	159	36					896
Photo-litho plates.....				83		171		1134	8					1,435
Totals.....	465	6,699	8,268	888	74	522	1,272	1,597	257	195	115	174	37	20,563



SESSIONAL PAPER No. 25b

## APPENDIX No. 8.

STATEMENT of work executed in the Lithographic Office from April 1, 1910, to March 31, 1911.

Month.	Maps.			Townships.			Forms.		
	No.	Copies.	Im-pressions.	No.	Copies.	Impres-sions.	No.	Copies.	Impres-sions.
April..... 1910	9	8,085	22,190	.....	.....	.....	4	339	339
May..... "	22	191,125	716,575	63	12,600	13,800	3	1,070	1,070
June..... "	16	6,811	7,036	138	27,600	27,800	.....	.....	.....
July..... "	4	900	900	12	2,400	2,400	2	700	700
August..... "	15	6,725	11,750	.....	.....	.....	9	11,475	11,725
September..... "	5	2,075	2,225	75	15,000	15,000	5	3,380	3,480
October..... "	23	9,500	9,575	96	19,200	20,300	6	1,590	1,590
November..... "	30	11,800	11,875	164	32,800	33,000	7	11,635	11,635
December..... "	4	725	725	.....	.....	.....	1	300	300
January..... 1911	5	935	1,145	51	10,200	10,200	6	7,130	9,630
February..... "	11	73,075	205,025	20	3,804	4,204	7	25,200	25,200
March..... "	17	107,650	284,475	121	24,200	24,200	5	10,700	12,700
Total.....	161	419,406	1,273,496	740	147,804	150,904	55	73,519	78,369

## RECAPITULATION.

	No.	Copies.	Impressions.	Cost.
				\$ cts.
Maps.....	161	419,406	1,273,496	3,356 68
Townships.....	740	147,804	150,904	5,301 20
Forms.....	55	73,519	78,369	1,032 12
Grand total.....	956	640,729	1,502,769	9,690 00



## APPENDIX No. 9.

LIST of employees of the Topographical Surveys Branch at Ottawa, giving the name, classification, duties of office and salary of each. (Metcalfe street, corner of Slater.)

Name.	Classification.		Duties of Office.	Salary.
	Division.	Sub-division.		
				\$
Deville, E., D.T.S., LL.D.....	1	A	Surveyor General. ....	3,550
	Correspondence.			
Brady, M. ....	1	B	Secretary. ....	2,300
Cullen, M. J. ....	3	A	Stenographer. ....	1,200
Moran, J. F. ....	3	A	Typewriter and clerk. ....	900
Williams, E. R. ....	3	A	Correspondence clerk. ....	900
Addison, W. G. ....	3	B	Typewriter. ....	750
Pegg, A. ....			Messenger. ....	800
O'Meara, M. T. ....			" . . . . .	500
Pick, A. C. ....			" . . . . .	500
	Accounts.			
Hunter, R. H. ....	2	A	Accountant. ....	2,050
Wilkinson, Percy . . . . .	3	A	Asst. Accountant. ....	1,050

Chief Draughtsman's Office—General direction and supervision of the technical work.

Symes, P. B. ....	1	B	Chief draughtsman. ....	2,350
Shanks, T., B.A.Sc., D.L.S. ....	1	B	Asst. chief draughtsman. ....	2,450



SESSIONAL PAPER No. 25b

## APPENDIX No. 9.—Continued.

Chief Draughtsman's Office, First Section—Survey instructions and general information.

Name.	CLASSIFICATION.		Duties of Office.	Salary.
	Division	Sub-division.		
				\$ cts.
Brown, T. E., B.A. ....	1	B	Chief of section. ....	2,450 00
Umbach, J. E., Grad. S.P.S., D.L.S. ....	2	A	Asst. chief of section ....	1,850 00
Barber, H. G., Grad. S.P.S. ....	2	A	" " ....	1,850 00
Rice, F. W., Grad. School of Mining. ....	2	A	" " ....	1,850 00
Belleau, J. A., D.L.S. ....	2	A	" " ....	1,950 00
Sylvain, J. ....	2	A	" " ....	1,650 00
McRae, A. D., B.A., B. Sc. ....	2	B	Draughtsman. ....	1,350 00
Carroll, M. J., Grad. S.P.S. ....	2	B	" ....	1,550 00
Grant, A. W., B.A. ....	2	B	" ....	1,350 00
Peaker, W. J., Grad. S.P.S. ....	2	B	" ....	1,250 00
Grant, A. M., B. Sc. ....	2	B	" ....	1,250 00
Milliken, J. B., B.A., B. Sc. ....	2	B	" ....	1,250 00
MacMillan, J. P., B.E. ....	2	B	" ....	1,250 00
Cordukes, J. P., B. Sc. ....	2	B	" ....	1,150 00
Wadlin, L. N., B. Sc. ....	2	B	" ....	1,150 00
Hayward, H. E., B. Sc. ....	2	B	" ....	1,250 00
McCully, R. C., B.A. ....	2	B	" ....	1,050 00
Gagnon, J. N. H., B.A. S. ....	2	B	" ....	1,000 00
Rochon, E. C. ....	2	B	" ....	1,350 00
Holbrook, C. H. ....	3	A	Clerk. ....	950 00
Burkholder, E. L. ....	3	A	" ....	900 00

Chief Draughtsman's Office, Second Section—Surveys in Manitoba, Saskatchewan, Alberta and Yukon.

Nash, T. S., Grad. S.P.S., D.L.S. ....	1	B	Chief of section. ....	2,400 00
Burgess, E. L., Grad. S.P.S., D.L.S., O.L.S. ....	2	A	Asst. chief of section. ....	1,850 00
Dennis, E. M., B. Sc. ....	2	A	" " ....	1,850 00
Elder, A. J., Grad. S.P.S., D.L.S. ....	2	A	" " ....	1,850 00
Henderson, F. D., Grad. S.P.S., D.L.S. ....	2	A	" " ....	1,850 00
Hill, S. N., Grad. S.P.S. ....	2	A	" " ....	1,850 00
Genest, P. F. X., Q.L.S. ....	2	A	" " ....	1,850 00
Robertson, D. F., Grad. S.P.S. ....	2	A	" " ....	1,650 00
Sutherland, H. E., B. Sc. ....	2	B	Draughtsman. ....	1,350 00
Kitto, F. H., D.L.S. ....	2	B	" ....	1,450 00
McClennan, W. D. ....	2	B	" ....	1,600 00
Roger, A., O.L.S. ....	2	B	" ....	1,600 00
Spreckley, R. O. ....	2	B	" ....	1,450 00
Goodday, Leonard. ....	2	B	" ....	1,350 00
Bray, R. P. ....	2	B	" ....	1,350 00
Harrison, E. W. ....	2	B	" ....	1,250 00
Ault, H. W. ....	2	B	" ....	1,250 00
Lytle, W. J. ....	2	B	" ....	1,000 00
La Bree, E. E. ....	2	B	" ....	1,000 00
Jones, G. S., Grad. S.P.S., O.L.S. ....	2	B	" ....	1,000 00
Bradley, J. D. ....	2	B	" ....	1,000 00
Dubuc, C. P., Q.L.S. ....	2	B	" ....	1,000 00
Cagnat, G. H. ....	2	B	" ....	1,000 00
Fournier, O. E., B.A.S. ....	2	B	" ....	1,000 00
Ross, C. M., B. Sc. ....	2	B	" ....	1,200 00
Macdonald, J. A. ....	3	B	Clerk. ....	800 00



APPENDIX No. 9.—Continued.

Chief Draughtsman's Office, Third Section—(Imperial Building, Queen street).  
Copying plans for reproduction.

Name.	CLASSIFICATION.		Duties of Office.	Salary.
	Division	Sub-division.		
				\$ cts.
Engler, Carl, B.A., D.L.S.	2	A	Chief of section	2,000 00
May, J. E.	2	A	Asst. "	1,850 00
O'Connell, J. R.	2	A	" "	1,650 00
Moule, W. J.	2	B	Draughtsman	1,600 00
Helmer, J. D.	2	B	Clerk	1,050 00
Archambault, E.	2	B	"	1,050 00
Dawson, R. J.	2	B	"	1,050 00
Watters, James.	3	A	Printer	1,200 00
Tremblay, A.	3	A	Clerk	900 00
Brown, A.	3	A	"	900 00
Ebbs, E. J.	3	A	"	900 00
Beaubien, A. H.	3	B	"	700 00
Baril, C.	3	B	"	700 00
Marchand, C. E.	3	B	Engrosser.	500 00

Chief Draughtsman's Office, Fourth Section—(Metcalf street, corner of Slater).  
British Columbia surveys.

Rowan-Legg, E. L.	2	A	Chief of section	2,000 00
Gillmore, E. T. B., Grad. R.M.C.	2	A	Asst. chief "	1,950 00
Lawe, H. D.L.S.	2	A	" "	1,850 00
MacIlquham, W. L., B. Sc.	2	A	" "	1,850 00
Morley, R. W.	2	A	" "	1,850 00
Weld, W. E.	2	A	" "	1,850 00
Wilson, E. E. D.	2	A	" "	1,600 00
Osmond, H. A.K.C.	2	B	Draughtsman	1,250 00
Harris, K. D.	2	B	"	1,250 00

Chief Draughtsman's Office, Fifth Section—(Imperial Building, Queen street).  
Mapping.

Smith, J.	1	B	Chief of section	2,450 00
Begin, P. A.	2	A	Asst. chief "	1,900 00
Flindt, A. H.	2	A	" "	1,650 00
Blanchet, A. E.	2	B	Draughtsman	1,600 00
Davies, T. E. S.	2	B	"	1,550 00
Perrin, V.	2	B	"	1,550 00
d'Orsonnens, A.	2	B	"	1,550 00
Davy, E.	2	B	"	1,350 00
Villeneuve, E.	2	B	"	1,050 00
Bergin, W.	2	B	"	1,050 00
Howie, Jas.	2	B	"	1,000 00
Purdy, W. A.	2	B	"	1,100 00
Brigly, J. H.	2	B	"	1,300 00



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**APPENDIX No. 9.—Concluded.**

Chief Draughtsman's Office, Sixth Section—(Imperial Building, Queen street).  
Scientific and topographical work.

Name.	Classification.		Duties of Office.	Salaries.
	Division	Sub-division		
				\$ cts.
Dodge, G. B., D.L.S. ....	1	B	Chief of section ....	2,450 00
Côté, J. A., Grad. R.M.C. ....	2	A	Asst. chief of section ....	1,600 00
Blanchard, J. F. ....	2	B	Draughtsman ....	1,000 00
Chartrand, D. E., B.Sc. ....	2	B	" ....	1,050 00
Cousineau, A., B.A.Sc. ....	2	B	" ....	1,050 00
Dozois, L. O. R., Grad. R.M.C. ....	2	B	" ....	1,050 00
Fredette, J. F. ....	2	B	" ....	1,000 00
Hoar, C. M., B.Sc., D.L.S. ....	2	B	" ....	1,000 00
Roe, B. J. ....	2	B	" ....	1,000 00
Lynch, F. J. ....	3	B	Typewriter ....	800 00
Watson, J. A. ....	3	B	Clerk ....	700 00

## Geographic Board (Woods Building, Slater street).

Whitcher, A. H., F.R.G.S., D.L.S. ....	2	A	Secretary ....	2,100 00
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## Photographic Office (Metcalf street, corner Slater street).

Carruthers, H. K. ....	2	A	Process photographer ....	1,850 00
Woodruff, John. ....	2	A	Chief " ....	1,850 00
Whitcomb, H. E. ....	3	A	Photographer " ....	1,200 00
Morgan, W. E. ....	3	A	" " ....	1,150 00
Kilmartin, A. ....	3	A	Asst. photographer ....	900 00
Devlin, A. ....	3	B	" " ....	800 00
Quimet, E. G. ....	3	B	" " ....	800 00

## Lithographic Office (unclassified) (Metcalf street, corner Slater street).

Name.	Occupation.	Salaries.
		\$
Moody, A. ....	Foreman ....	25 00 per week.
Burnett, E. ....	Lithographer ....	25 00 "
Thicke, C. R. ....	" " ....	22 00 "
Deslauriers, J. H. ....	Transferrer ....	20 00 "
Bergin, J. ....	Printer ....	20 00 "
Thicke, H. S. ....	" " ....	18 00 "
Boyle, S. ....	Stone polisher ....	14 00 "
Gagnon, J. ....	Press feeder ....	11 00 "
Kane, P. ....	" " ....	8 00 "
Easton, H. M. ....	Printer ....	18 50 "
Hare, E. H. ....	Asst. photographer ....	14 00 "



## APPENDIX No. 10.

List of Dominion Land Surveyors who have been supplied with Standard Measures.

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Akins, James Robert.....	Kinburn, Ont. ....	Sept. 2, '76	Mar. 14, '10	
Allison, Calvin Bruce.....	South Woodslee, Ont.	June 16, '84	Mar. 28, '10	
Ashton, Arthur Ward.....	Ottawa, Ont. ....	Nov. 5, '80	May 29, '08	
Austin, George Frederick.....	Not known.		April 14, '72	
Aylen, John.....	North Bay, Ont. ....		May 29, '85	
Aylsworth, Charles Fraser.....	Madoc, Ont. ....	April 21, '62	May 13, '86	O. L. S.
Baker, James Clarence.....	Vermilion, Alta. ....	May 12, '78	May 18, '06	
Baker, Mason Hermon.....	St. Thomas, Ont. ....	July 9, '84	Aug. 6, '08	O. L. S.
Bayne, George A.....	Winnipeg, Man. ....	Oct. 25, '50	April 14, '72	M. L. S.
Beatty, David.....	Parry Sound, Ont. ....	Dec. 22, '42	April 14, '72	O. L. S.
Begg, William Arthur.....	Hamilton, Ont. ....	July 15, '82	June 8, '09	
Belanger, Phidime Roch Arthur	Ottawa, Ont. ....	Mar. 5, '53	May 17, '80	Inspector of Surveys, Topographical Surveys Branch, Dept. of the Interior.
Belleau, Joseph Alphonse. ....	Ottawa, Ont. ....	Sept. 30, '56	May 15, '83	Topographical Surveys Branch, Dept. of the Interior.
Bemister, George Bartlett.....	Winnipeg, Man. ....		June 11, '78	M. L. S. Engineering Dept. C.N.R.
Bennett, George Arthur.....	Eden, Ont. ....	May 18, '86	Aug. 25, '10	
Bigger, Charles Albert.....	Ottawa, Ont. ....	Aug. 15, '53	Mar. 30, '82	B. C. L. S., O. L. S., As- sistant Superintendent Geodetic Survey.
Bingham, Edwin Ralph.....	Fort William, Ont. ....	— '78	Oct. 25, '06	O. L. S.
Blanchet, Guy Houghton.....	Ottawa, Ont. ....	Feb. 12, '84	Mar. 10, '10	
Boswell, Elias John.....	Not known.....		Mar. 18, '03	O. L. S., M. L. S.
Bourgeault, Armand.....	St. Jean Port Joli, Que. ....	Feb. 23, '58	Mar. 29, '83	Q. L. S.
Bourgault, Charles Eugene.....	St. Jean Port Joli, Q.	Sept. 6, '61	Feb. 21, '88	
Bourget, Charles Arthur.....	Lauzon, Que. ....	Aug. 26, '51	May 14, '84	Q. L. S.
Bowman, Herbert Joseph.....	Berlin, Ont. ....	June 18, '65	Feb. 16, '88	O. L. S.
Brabazon, Alfred James.....	Ottawa, Ont. ....		May 13, '82	Boundary Survey, Dept. of the Interior.
Brady, James.....	Golden, B.C. ....	Nov. 24, '40	April 14, '72	O. L. S., B. C. L. S.
Bray, Samuel.....	Ottawa, Ont. ....	Nov. 5, '46	Nov. 14, '83	O. L. S., Chief Surveyor, Dept. of Indian Affairs.
Bray, Lennox Thomson.....	Amherstburg, Ont. ....	Mar. 14, '77	Feb. 18, '03	O. L. S.
Brenot, Lucien.....	Ottawa, Ont. ....	Aug. 31, '87	Mar. 18, '10	
Bridgland, Morrison Parsons...	Calgary, Alta. ....	Dec. 20, '78	Mar. 10, '05	
Broughton, George Henry.....	Penticton, B.C. ....	Aug. 12, '86	June 3, '09	B. C. L. S.
Brown Charles Dudley.....	Winnipeg, Man. ....	Feb. 25, '83	April 4, '10	
Brown, Thomas Wood.....	Edmonton, Alta. ....		June 21, '09	
Brownlee, James Harrison.....	Vancouver, B.C. ....	Mar. 22, '56	April 15, '87	M. L. S., B. C. L. S.
Bucknill, Walter Birch.....	Vancouver, B. C. ....	May 8, '73	Mar. 19, '08	B. C. L. S.
Burgess, Edward LeRoy.....	Ottawa, Ont. ....	May 5, '78	Feb. 23, '05	O. L. S., T. S. Branch, Dept. of Interior.
Burnet, Hugh.....	Victoria, B.C. ....		June 22, '85	O. L. S., B. C. L. S.
Burwash, Nathaniel Alfred.....	Whitehorse, Y.T. ....	Sept. 28, '79	Mar. 6, '07	O. L. S.
Burwell, Herbert Mahlon.....	Vancouver, B.C. ....	Oct. 23, '63	Feb. 17, '87	B. C. L. S.
Campbell, Alan John.....	Sidney, B.C. ....	Oct. 1, '82	April 13, '09	
Campbell, Alexander Stewart...	Kingston, Ont. ....	Mar. 7, '80	Mar. 6, '09	
Carbert, Joseph Alfred.....	Medecine Hat, Alta.	Feb. 4, '56	May 12, '80	O.L.S., District Engineer and Surveyor, Dept. of Public Works, Alberta.
Carpenter, Henry Stanley.....	Regina, Sask. ....	Feb. 8, '74	Feb. 20, '01	Dept. of Public Works, O. L. S.
Carroll, Cyrus.....	Prince Albert, Sask.	Dec. 6, '34	April 14, '72	O. L. S.
Carson, Percy Alexander.....	Ottawa, Ont. ....	Dec. 25, '77	Feb. 22, '06	
Carthew, William Morden....	Edmonton, Alta. ....	Oct. 19, '86	Mar. 29, '10	



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## APPENDIX No. 10—Continued.

List of Dominion Land Surveyors who have been supplied with Standard Measures—Continued.

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Cautley, Reginald Hutton.....	Edmonton, Alta....	Dec. 6, '79	May 1, '05	
Cautley, Richard William.....	Edmonton, Alta....	Aug. 3, '73	Sept. 2, '96	
Cavana, Allan George.....	Orillia, Ont.....	Jan. 22, '58	Nov. 16, '76	O. L. S.
Charlesworth, Lionel Clare....	Edmonton, Alta....	Nov. 17, '73	Mar. 24, '03	O. L. S., Dept. of Public Works for Alberta.
Chilver, Charles Alonzo.....	Walkerville, Ont....	Feb. 8, '83	Feb. 22, '07	
Christie, William.....	Prince Albert, Sask.	Feb. 13, '76	Mar. 22, '06	
Clarke, Charles Wentworth.....	Regina, Sask.....	Nov. 19, '75	Mar. 24, '10	
Cleveland, Ernest Albert.....	Vancouver, B. C....	May 12, '74	June 27, '99	B. C. L. S.
Coates, Preston Charles.....	Golden, B. C.....	May 16, '81	Apr. 19, '07	B. C. L. S.
Cokely, Leroy S.....	Merritt, B. C.....	Nov. 23, '84	Mar. 22, '10	
Côté, Joseph Adélard.....	Prince Albert, Sask.	June 5, '64	May 14, '84	
Côté, Jean Léon.....	Edmonton, Alta....	May 6, '67	Mar. 21, '90	
Cotton, Arthur Frederick.....	New Westminster, B. C.....	Aug. 8, '52	May 11, '80	O. L. S., B. C. L. S.
Craig, John Davidson.....	Ottawa, Ont.....	Jan. 30, '76	Feb. 24, '02	Boundary Surveys, Dept. of the Interior.
Cumming, Austin Lewis.....	Cornwall, Ont.....	Aug. 25, '82	Feb. 3, '10	
Cummings, Alfred.....	Fernie, B. C.....	July 3, '80	Mar. 3, '09	B. C. L. S.
Cummings, John George.....	Cranbrook, B. C....	Nov. 19, '73	Feb. 17, '04	B. C. L. S.
Dalton, John Joseph.....	Weston, Ont.....	June 12, '54	Apr. 17, '79	O. L. S., D. T. S.
Davies, Thomas Attwood.....	Edmonton, Alta....		Feb. 22, '06	
Dawson, Frederick James.....	Ashcroft, B. C.....	Sept. 22, '86	Sept. 12, '10	
Day, Harry Samuel.....	St. John, N. B.....	Nov. 14, '85	Mar. 9, '10	
Deans, William James.....	Brandon, Man.....	May 4, '60	May 13, '86	O. L. S.
de la Condamine, C.....	High River, Alta....	Feb. 13, '75	May 4, '10	
Dennis, John Stoughton.....	Calgary, Alta.....	Oct. 22, '56	Nov. 19, '77	D. T. S.
Denny, Herbert C.....	Not known.....		Apr. 1, '82	
Dickson, Henry Godkin.....	Whitehorse, Y. T....	Mar. 29, '64	Mar. 19, '89	M. L. S.
Dickson, James.....	Fenelon Falls, Ont..	Oct. 30, '34	Apr. 14, '72	O. L. S.
Dobie, James Samuel.....	Thessalon, Ont.....	Oct. 15, '73	Mar. 22, '06	O. L. S.
Doupe, Jacob Lonsdale.....	Winnipeg, Man.....	Sept. 14, '67	Oct. 6, '88	M. L. S., Asst. Land Commissioner for C. P. R.
Drewry, William Stewart.....	Nelson, B. C.....	Jan. 20, '59	Nov. 14, '83	O. L. S., B. C. L. S.
Driscoll, Alfred.....	Edmonton, Alta....	July 2, '65	Feb. 23, '87	B. C. L. S.
Drummond, Thomas.....	Montreal, P. Q.....		1856 June 24, '78	D. T. S.
Ducker, William A.....	Winnipeg, Man.....	Apr. 4, '52	Mar. 30, '83	O. L. S., M. L. S.
Dunais, Paul T. Concorde.....	Hull, P. Q.....	Jan. 2, '47	Mar. 29, '82	Q. L. S.
Edwards, George.....	Ponoka, Alta.....	June 13, '42	Apr. 14, '72	O. L. S.
Edwards, William Milton.....	Lethbridge, Alta....	June 21, '79	Apr. 5, '10	
Ellacott, Charles Herbert.....	Victoria, B. C.....	Dec. 24, '66	Feb. 22, '99	B. C. L. S.
Empey, John Morgan.....	Calgary, Alta.....	Apr. 16, '74	Feb. 23, '05	O. L. S.
Engler, Carl.....	Ottawa, Ont.....	Sept. 30, '72	Feb. 23, '05	T. S., Branch Dept. of Interior.
Fairchild, Charles Courtland..	Brantford, Ont.....	Feb. 21, '67	Feb. 20, '01	O. L. S.
Farncomb, Alfred Ernest.....	Lacombe, Alta....	May 22, '73	Mar. 12, '02	O. L. S.
Fawcett, Thomas.....	Toronto, Ont.....	Oct. 28, '48	Nov. 18, '76	O. L. S., D. T. S.
Fawcett, Adam.....	Gravenhurst, Ont..		Feb. 22, '93	
Ferguson, George Hendry.....	Toronto, Ont.....	Jan. 20, '83	June 2, '09	
Findlay, Allan.....	Winnipeg, Man.....	Oct. 15, '80	Mar. 21, '08	
Fontaine, Louis Elie.....	Levis, P. Q.....	Oct. 3, '68	Nov. 30, '92	
Francis, John.....	Portage la Prairie, M.	Dec. 22, '52	June 17, '75	M. L. S.
Garden, James Ford.....	Vancouver, B. C....	Feb. 19, '47	May 13, '80	B. C. L. S.
Garden, George H.....	Lethbridge, Alta....		Apr. 14, '72	Deputy Surveyor for N. B.
Garden, Charles.....	Not known.....		Apr. 14, '72	Deputy Surveyor for N. B.
Garner, Albert Coleman.....	S. Qu'Appelle, Sask.	Sept. 6, '78	May 27, '07	
Gauvreau, Louis Pierre.....	Not known.....		Apr. 14, '72	
Gibbon, James.....	Dawson, Y. T.....	June 25, '60	Feb. 12, '91	O. L. S.
Gordon, Maitland Lockhart.....	Vancouver, B. C....		Feb. 18, '04	B. C. L. S.
Gordon, Robert John.....	Lethbridge, Alta....	June 18, '69	Mar. 12, '02	
Gore, Thomas Sinclair.....	Victoria, B. C.....		1832 Apr. 19, '79	B. C. L. S.
Graham, John Robertson.....	Ottawa, Ont.....	April 18, '87	May 26, '10	
Green, Alfred Harold.....	Nelson, B. C.....	Jan. 20, '79	Feb. 23, '05	B. C. L. S.



## APPENDIX No. 10—Continued.

LIST of Dominion Land Surveyors who have been supplied with Standard Measures—Continued.

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Green, Thomas Daniel.....	Prescott, Ont.....	Dec. 21, '57	May 19, '84	O.L.S.
Green, Frank Compton.....	Nelson, B.C.....	.....	May 8, '03	B.C.L.S.
Grover, George Alexander.....	Norwood, Ont.....	.....	Feb. 18, '04	.....
Hamilton, James Frederick...	Lethbridge, Alta.....	Apr. 4, '69	June 2, '09	.....
Harris, John Walter.....	Winnipeg, Man.....	Feb. 26, '48	Apr. 14, '72	O.L.S., M.L.S., City Surveyor.
Harrison, Edward.....	Belleville, Ont.....	.....	May 14, '10	.....
Harvey, Charles.....	Kelowna, B.C.....	May 5, '76	Feb. 17, '04	B.C.L.S.
Hawkins, Albert Howard.....	Listowel, Ont.....	July 27, '62	Mar. 6, '06	.....
Heaman, John Andrew.....	Winnipeg, Man.....	June 3, '75	July 15, '09	O.L.S.
Heathcott, Robert Vernon.....	Edmonton, Alta.....	July 7, '81	May 13, '07	.....
Henderson, Walter.....	Not known.....	.....	Nov. 17, '83	.....
Heuperman, Lambertus Fred.....	Calgary, Alta.....	Sept. 20, '81	Mar. 29, '10	.....
Holcroft, Herbert Spencer.....	Toronto, Ont.....	Sept. 4, '77	Feb. 18, '03	O.L.S.
Hopkins, Marshall Willard.....	Edmonton, Alta.....	May 24, '61	Feb. 20, '01	O.L.S.
Hubbell, Ernest Wilson.....	Ottawa, Ont.....	Nov. 5, '62	May 19, '84	Inspector of Surveys, Topographical Surveys Branch, Dept. of Interior.
James, Silas.....	Toronto, Ont.....	June 19, '34	Apr. 14, '72	O.L.S.
Jephson, Richard Jermy.....	Brandon, Man.....	Feb. 5, '54	May 12, '80	O.L.S., B.C.L.S.
Johnson, Alfred William.....	Kamloops, B.C.....	Feb. 23, '74	Mar. 12, '02	B.C.L.S.
Keith, Homer Pasha.....	Edmonton, Alta.....	Aug. 30, '85	Feb. 1, '11	.....
Kimpe, Maurice.....	Edmonton, Alta.....	Jan. 17, '76	May 13, '07	.....
King, William Frederick.....	Dominion Observatory, Ottawa, Ont.	Feb. 19, '54	Nov. 21, '76	D.T.S., Chief Astronomer Dept. of Interior.
Kirk, John Albert.....	Summerland, B.C.....	Jan. 9, '54	May 11, '80	O.L.S., B.C.L.S.
Kitto, Franklin Hugo.....	Ottawa, Ont.....	Mar. 28, '80	Mar. 6, '08	Topographical Surveys Br., Dept. of Interior.
Klotz, Otto Julius.....	Dominion Observatory, Ottawa, Ont.	Mar. 31, '52	Nov. 19, '77	O.L.S., D.T.S., Astronomer, Dept. of Interior.
Knight, Richard H.....	Edmonton, Alta.....	June 7, '77	Feb. 18, '04	.....
Lang, John Leiper.....	Toronto, Ont.....	.....	Oct. 14, '08	.....
Latimer, Frank Herbert.....	Penticton, B.C.....	May 23, '60	Nov. 13, '85	.....
Laurie, Richard C.....	Battleford, Sask.....	Jan. 31, '58	April 27, '83	.....
Lawe, Henry.....	Ottawa, Ont.....	Feb. 28, '38	April 14, '72	O.L.S., M.L.S. Topographical Surveys Branch, Dept. of Interior.
Lemoine, Charles Errol.....	Ville Montcalme, P.Q.....	.....	Mar. 31, '82	Q.L.S.
Lendrum, Robert Watt.....	Strathcona, Alta.....	July 24, '34	May 15, '80	O.L.S.
Lighthall, Abram.....	Vankleek Hill, Ont.....	Mar. 30, '78	Dec. 25, '09	.....
Lonergan Gerald Joseph.....	Buckingham, P.Q.....	Oct. 8, '71	Feb. 28, '01	Q.L.S. Inspector of Surveys, Dept. of Interior.
Lumsden, Hugh David.....	Ottawa, Ont.....	Sept. 7, '44	April 14, '72	O.L.S.
MacLennan, Alexander L.....	Toronto, Ont.....	May 10, '78	Feb. 23, '05	.....
MacPherson, Charles Wilfrid.....	Dawson, Y.T.....	Sept. 6, '71	Mar. 7, '00	O.L.S. Director of Surveys, Y.T.
Magrath, Charles Alexander....	Lethbridge, Alta.....	April 22, '60	Nov. 16, '81	B.A.Sc., O.L.S., B.C.L.S., D.T.S.
Martyn, Oscar William.....	Mitchell, Ont.....	Dec. 2, '88	Mar. 11, '11	.....
Meadows, William Walter.....	Maple Creek, Sask.....	May 27, '73	Feb. 23, '05	O.L.S.
Miles, Charles Falconer.....	Toronto, Ont.....	Jan. 30, '38	Apr. 14, '72	O.L.S. Inspector of Surveys, Dept. of Interior.
Mitchell, Benjamin Foster.....	Calgary, Alta.....	June 16, '80	April 16, '08	.....
Moberly, Harford Kenneth.....	Moosomin, Sask.....	.....	April 21, '03	.....
Molloy, John.....	Winnipeg, Man.....	Jan. 13, '40	April 14, '72	M.L.S.
Montgomery, Royal Harp.....	Prince Albert, Sask.....	May 20, '82	Feb. 23, '05	O.L.S.
Moore, Herbert Harrison.....	Calgary, Alta.....	Dec. 1, '69	Feb. 17, '04	.....
Morrier, Joseph Eldedge.....	Ottawa, Ont.....	Aug. 29, '74	May 16, '07	.....
McArthur, James Joseph.....	Ottawa, Ont.....	May 9, '56	April 17, '79	Boundary Survey, Dept. of Interior.
McCaw, Robert Daniel.....	Sidney, B.C.....	May 24, '83	Mar. 23, '09	.....



SESSIONAL PAPER No. 25b

## APPENDIX No. 10—Continued.

List of Dominion Land Surveyors who have been supplied with Standard Measures—Continued.

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
McColl, Gilbert Beebe. ....	Winnipeg, Man. ....	Oct. 8, '82	Mar. 20, '07	M.L.S., D.T.S.
McDiarmid, Stuart Stanley....	Vancouver, B.C. ....	Aug. 4, '81	Feb. 23, '05	B.C.L.S.
McFadden, Moses. ....	Vancouver, B.C. ....	Aug. 26, '26	April 14, '72	O.L.S., M.L.S.
McFarlane, Walter Graham ...	Toronto, Ont. ....	Sept. 28, '75	May 19, '05	
McFarlane, John Baird. ....	Claremont, Ont. ....	Feb. 25, '79	June 3, '08	
McFee, Angus. ....	Red Deer, Alta. ....	July 14, '46	April 19, '79	
McGeorge, William Graham....	Chatham, Ont. ....	Mar. 22, '87	Mar. 21, '10	
McGrandle, Hugh. ....	Wetaskiwin, Alta. ....	Mar. 12, '57	Mar. 30, '83	O.L.S.
McKenna, John Joseph. ....	Dublin, Ont. ....		April 14, '72	O.L.S.
McKenzie, John. ....	New Westminster, B.C. ....	Oct. 31, '47	Nov. 18, '87	
McLean, James Keachie. ....	Ottawa, Ont. ....	Dec. 19, '51	April 1, '82	O.L.S. Dept. of Indian Affairs.
McMillan, George. ....	Finch, Ont. ....	Dec. 9, '69	Feb. 22, '06	
McNaughton, Alexander L. ....	Cornwall, Ont. ....	Sept. 30, '81	Feb. 23, '05	O.L.S., B.C.L.S.
McPherson, Archibald John ...	Regina, Sask. ....		Feb. 21, '01	
McPhillips, George. ....	Winnipeg, Man. ....	April 26, '48	June 17, '75	O.L.S., M.L.S.
McPhillips, Robert Charles. ....	Winnipeg, Man. ....	April 24, '56	May, '78	
McVittie, Archibald W. ....	Victoria, B.C. ....	May 5, '58	Mar. 30, '82	B.C.L.S.
Nash, Thomas Sanford. ....	Ottawa, Ont. ....	July 2, '75	Feb. 18, '04	Topographical Surveys Branch, Dept. of Interior
Ogilvie, William. ....	Ottawa, Ont. ....	April 7, '46	April 14, '72	O.L.S.
O'Hara, Walter Francis. ....	Ottawa, Ont. ....		Feb. 19, '95	O.L.S.
Ord, Lewis Redman. ....	Hamilton, Ont. ....	Oct. 17, '56	April 1, '82	O.L.S.
Parsons, Johnstone Lindsay R. ....	Regina, Sask. ....	Jan. 18, '76	Feb. 23, '05	O.L.S.
Patrick, Allan Poyntz. ....	Calgary, Alta. ....	July 18, '49	Nov. 19, '77	B.C.L.S., D.T.S.
Patten, Thaddeus James. ....	Little Current, Ont. ....	Feb. 4, '59	Mar. 29, '83	O.L.S.
Pearce, William. ....	Calgary, Alta. ....	Feb. 1, '48	May 10, '80	O.L.S., B.C.L.S.
Pequegnat, Marcel. ....	Berlin, Ont. ....	April 27, '86	June 6, '10	
Peters, Frederic Hatheway. ....	Calgary, Alta. ....	Nov. 4, '83	Mar. 4, '10	Commiss'er of Irrigation
Phillips, Edward Horace. ....	Saskatoon, Sask. ....	Dec. 19, '78	Feb. 24, '02	
Phillips, Harold Geoffrey. ....	Saskatoon, Sask. ....	Sept. 3, '87	April 23, '10	
Pierce, John Wesley. ....	Haileybury, Ont. ....		Dec. 24, '09	
Plunkett, Thomas Hartley. ....	Meaford, Ont. ....	June 1, '78	Mar. 12, '08	
Ponton, Archibald William. ....	Edmonton, Alta. ....	Jan. 25, '59	May 18, '81	O.L.S.
Proudfoot, Hume Blake. ....	Saskatoon, Sask. ....	June 23, '58	Mar. 28, '82	O.L.S.
Rainboth, Edward Joseph. ....	Ottawa, Ont. ....		May 19, '81	Q.L.S., O.L.S.
Ransom, John Thomas. ....	Toronto, Ont. ....	Aug. 24, '88	Jan. 14, '11	
Reid John Lestock. ....	Prince Albert, Sask. ....	Sept. 12, '41	April 14, '72	Dept. of Indian Affairs.
Reilly, William Robinson. ....	Regina, Sask. ....	Aug. 10, '57	Nov. 17, '81	O.L.S., M.L.S.
Richard, Joseph Francois. ....	Ste. Anne de la Pocatière, P.Q. ....		May 13, '82	
Rinfret, Raoul. ....	Montreal, P.Q. ....	July 16, '56	Feb. 20, '00	Q.L.S.
Ritchie, Joseph Frederick. ....	Prince Rupert, B.C. ....	May 23, '63	Jan. 7, '89	B.C.L.S.
Robertson, Henry H. ....	N. Temiskaming, P.Q. ....	Sept. 13, '47	Apr. 14, '72	Q.L.S.
Roberts, Sydney Archibald. ....	Victoria, B.C. ....	April 10, '48	May 16, '85	B.C.L.S.
Roberts, Vaughan Maurice. ....	Goderich, Ont. ....	Mar. 22, '64	May 17, '86	
Robinson, Ernest Walter P. ....	Ottawa, Ont. ....	May 8, '80	May 1, '08	
Robinson, Franklin Joseph. ....	Regina, Sask. ....	Oct. 20, '70	Feb. 20, '00	Deputy Minister of Public Works.
Rolfson, Orville. ....	Walkerville, Ont. ....	Feb. 26, '85	July 11, '08	
Rombough, Marshall Bedwell. ....	Morden, Man. ....	Oct. 14, '35	April 14, '72	M.L.S.
Rorke, Louis Valentine. ....	Toronto, Ont. ....	Feb. — '65	Aug. 13, '91	O.L.S. Inspector of Surveys for Ontario.
Ross, George. ....	Welland, Ont. ....	June 12, '53	Nov. 21, '82	O.L.S.
Ross, Joseph Edmund. ....	Kamloops, B.C. ....	Jan. 9, '61	Feb. 12, '91	O.L.S., B.C.L.S.
Routly, Herbert Thomas. ....	Haileybury, Ont. ....	Jan. 20, '78	Feb. 15, '11	
Roy, George Peter. ....	Quebec, P.Q. ....	Oct. 1, '52	Nov. 17, '81	Q.L.S.
Roy, Joseph George Emile. ....	Quebec, P.Q. ....	Mar. 14, '86	May 25, '10	
Saint Cyr, Jean Baptiste. ....	Montreal, P.Q. ....	Dec. 17, '66	Feb. 17, '87	Q.L.S.
Saint Cyr, Arthur. ....	Ottawa, Ont. ....	Nov. — '60	Feb. 17, '87	



APPENDIX No. 10—*Concluded.*

List of Dominion Land Surveyors who have been supplied with Standard Measures—*Concluded.*

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Saunders, Bryce Johnston.....	Edmonton, Alta....	Oct. 17, '60	Nov. 16, '84	O.L.S.
Scott, Walter Alexander.....	Galt, Ont.....	Aug. 8, '85	Mar. 9, '09	
Seager, Edmund.....	Kenora, Ont.....	Nov. 22, '38	April 14, '72	O.L.S.
Sewell, Henry DeQuincy.....	Toronto, Ont.....	April 18, '48	May 16, '85	O.L.S.
Seymour, Horace Llewellyn.....	Edmonton, Alta....	June 11, '82	Feb. 22, '06	O.L.S.
Shaw, Charles Aeneas.....	Greenwood, B.C....	Nov. 16, '53	May 10, '80	O.L.S., B.C.L.S.
Sheply, Joseph Drummond.....	N. Battleford, Sask..	Sept. 13, '79	Mar. 12, '06	
Smith, Charles Campbell.....	Ottawa, Ont.....	Jan. 1, '73	Feb. 22, '06	O.L.S.
Smith, Donald Alpine.....	Claude, Ont.....	Sept. 22, '80	April 21, '10	
Smith, James Herbert.....	Edmonton, Alta....	Nov. 9, '76	Feb. 23, '05	
Speight, Thomas Bailey.....	Toronto, Ont.....	Feb. 8, '59	Nov. 16, '82	O.L.S.
Starkey, Samuel M.....	Codys, N.B.....	Sept. 4, '37	April 14, '72	
Steele, Ira John.....	Ottawa, Ont.....	April 6, '81	April 16, '08	
Stewart, Elihu.....	Collingwood, Ont....	Nov. 17, '44	April 14, '72	O.L.S.
Stewart, Lionel Douglas N.....	Collingwood, Ont....		Jan. 27, '10	
Stewart, Will Malcolm.....	Saskatoon, Sask....	Nov. 26, '84	June 6, '07	
Stewart, Louis Beaufort.....	Toronto, Ont.....	Jan. 27, '61	Nov. 22, '82	O.L.S., D.T.S.
Stewart, George Alexander.....			April 14, '72	O.L.S.
Stock, James Joseph.....	Ottawa, Ont.....	Aug. 16, '87	Mar. 2, '10	
Street, Paul Bishop.....	Toronto, Ont.....	Dec. 3, '81	Mar. 29, '10	
Summers, Gordon Foster.....	Haileybury, Ont.....		Oct. 20, '10	
Talbot, Albert Charles.....	Calgary, Alta.....	April 5, '56	May 13, '80	
Taylor, Alexander.....	Portage la Prairie, Man.	Aug. 6, '75	June 9, '04	M.L.S.
Taylor, William Emerson.....	Owen Sound, Ont....	Aug. 3, '81	Dec. 16, '10	
Teasdale, Charles Montgomery.....	Concord, Ont.....	Oct. 18, '79	Mar. 9, '06	
Thompson, William Thomas.....	Grenfell, Sask.....	Nov. 1, '53	Nov. 19, '77	D.T.S.
Tracy, Thomas Henry.....	Vancouver, B.C....	June 25, '48	April 14, '72	O.L.S., B.C.L.S.
Tremblay, Alfred Joseph.....	Les Eboulements, P.Q.		Feb. 18, '90	
Turnbull, Thomas.....	Winnipeg, Man....	May 26, '57	Mar. 29, '82	O.L.S.
Tyrrell, James William.....	Hamilton, Ont.....	May 10, '63	Feb. 16, '87	O.L.S.
Vaughan, Josephus Wyatt.....	Vancouver, B.C....	Oct. 17, '45	June 11, '78	B.C.L.S.
Vicars, John Richard Odum.....	Kamloops, B.C....	April 16, '55	May 17, '86	O.L.S., B.C.L.S.
Waddell, William Henry.....	Edmonton, Alta....	Mar. 23, '83	Mar. 25, '07	O.L.S.
Waldron, John.....	Pine Grove, Ont.....	Aug. 1, '72	April 2, '07	
Walker, Claude Melville.....	Guelph, Ont.....	Oct. 16, '84	Mar. 11, '11	
Walker, Ernest Ward.....	Regina, Sask.....	Dec. 26, '75	Mar. 27, '07	
Wallace, James Nevin.....	Calgary, Alta.....	Aug. 21, '70	Feb. 20, '00	O.L.S.
Warren, James.....	Walkerton, Ont.....	Nov. 7, '37	April 14, '72	
Watt, George Herbert.....	Ottawa, Ont.....	Feb. 5, '76	Feb. 24, '02	
Weekes, Abel Seneca.....	Edmonton, Alta....	Feb. 17, '66	Feb. 11, '92	
Weekes, Melville Bell.....	Regina, Sask.....	Nov. 28, '74	Feb. 18, '03	O.L.S.
Wheeler, Arthur Oliver.....	Calgary, Alta.....	May 1, '60	Nov. 21, '82	O.L.S., B.C.L.S.
White-Fraser, George W. R. M.....	Ottawa, Ont.....		Feb. 21, '88	D.T.S.
Wiggins, Thomas Henry.....	Saskatoon, Sask....	Aug. 24, '63	Feb. 18, '96	O.L.S.
Wilkins, Frederick W. B.....	Norwood, Ont.....	June 27, '54	Mar. 18, '81	O.L.S., D.T.S.
Wilkinson, William Downing.....	Not known.....		Feb. 22, '93	
Williams, Guy Lorne.....	Enderby, B.C.....	Mar. 3, '79	June 24, '08	B.C.L.S.
Woods, Joseph Edward.....	Pincher Creek, A.ta.	Oct. 13, '61	Nov. 14, '85	
Young, Walter Beatty.....	Winnipeg, Man.....	July 6, '80	Mar. 25, '05	M.L.S.
Young, William Howard.....	Lethbridge, Alta....	June 8, '78	May 17, '07	



## GENERAL REPORTS OF SURVEYORS

1910-1911

## APPENDIX No. 11.

## ABSTRACT OF THE REPORT OF J. R. AKINS, D.L.S.

## BASE LINE AND MISCELLANEOUS SURVEYS IN SOUTHWESTERN ALBERTA.

After four days spent in having the horses shod, getting the outfit together, engaging men and testing instruments we left Morley for the field on May 13, 1910 and reached the northeast corner of township 20 range 7 west of the fifth meridian on the 17th.

My instructions were to extend the sixth base line across ranges 7, 8 and 9 from the Elbow to Kananaskis river, so that a meridian line might be run north through the valley of the Kananaskis, to locate, and tie to the Dominion Lands system of survey, some coal claims in townships 21, 22 and 23, range 9.

Between these two rivers the country is very mountainous, being a sea of high peaks and ridges, some of an elevation of ten thousand feet. To produce the line over these by ordinary surveying operations was out of the question. Our method was to produce the line in proper azimuth and to obtain the distance by a system of triangulation.

We laid out a base line in the valley of Elbow river of one hundred and forty-seven chains, and one hundred and nineteen chains of this we used as a second base, thus having a common side for the two triangles. Corrections to the measurements were made for sag, temperature and difference of elevation of stations. In the triangulation, all the angles were read to seconds by repetition. The work was carried on as far as practicable from the camp on the Elbow and our next camp was pitched on Fisher creek at its intersection by the base line. From this point we worked westerly making flying camps to about timber-line on the sides of the mountains.

During the month of May clouds interfered considerably with the work; in many cases several trips up a mountain had to be made before the angles could be read. In June our troubles were increased by smoke from fires to the east and south of us.

About the end of June we reached Kananaskis river and from there we carried on operations by man-packing over the ridge. After getting the line and triangulation to the Kananaskis valley we checked our work by measuring a side of a triangle whose length had been obtained already by calculation. The distances checked to about a link.

We finished operations in the Kananaskis valley about the end of October, with the snow one foot and a half deep on the tops of the mountains.

We returned to Morley and on October 31 started for township 24, range 6, where we worked till December 7 when we returned to Morley and disbanded.



## APPENDIX No. 12.

## ABSTRACT OF THE REPORT OF C. F. AYLSWORTH, D.L.S.

## RESURVEYS IN SOUTHEASTERN SASKATCHEWAN AND MANITOBA.

Having organized my party at Winnipeg we left on May 6 for Kamsack and began work in township 31, range 31, west of the principal meridian on May 12. We resurveyed part of this township and also part of township 30 in the same range.

On June 10 we moved to township 30, range 1, west of the second meridian, where we retraced sections 1, 2, 3, 4, 5 and 6 adjoining the headquarters of the Doukhobor colony at Veregin station. This colony at the time of my visit were preparing to leave for British Columbia. Their lands and other properties were being offered for sale including a grist-mill and elevator together with a residence for help, valued at \$52,000, a brick manufacturing plant and a wholesale warehouse with office and store. We also made a traverse of Whitesand river across section 36 in this township and surveyed a school site on section 4, township 30, range 2. We then returned to Kamsack to make a resurvey of sections 22 and 27 in township 29, range 32, west of the principal meridian.

Our next work was in township 28, range 5, west of the second meridian, where we retraced several sections. On August 2 we left for township 2, range 12, west of the second meridian and made a complete new survey of the township. The land in this township is good and although there was little rain during 1910 crops were very fair. The district has been retarded by lack of railway facilities but the Canadian Pacific railway has a branch now under construction westward from Estevan.

Our next work was some retracement surveys in township 20, range 21, west of the principal meridian which we completed on October 3 and then proceeded to Tyn-dall to make retracement surveys in townships 13, ranges 6, 7 and 8 and township 14, range 7, east of the principal meridian. These surveys kept us busy until the close of the season.



## APPENDIX No. 13.

## ABSTRACT OF THE REPORT OF P. R. A. BELANGER, D.L.S.

## MISCELLANEOUS SURVEYS IN ALBERTA AND MANITOBA AND INSPECTION OF CONTRACT

## SURVEYS IN MANITOBA.

I organized my party at Winnipeg on April 9, 1910, and proceeded to Sandy lake to reinspect contract No. 33 of 1907. This contract is situated in a district settled largely by Galicians who are converting a bush country, formerly considered valueless, into good farm land.

On May 4 I returned to Winnipeg and after inspecting the iron posts manufactured by the Manitoba Bridge and Iron Works and the Vulcan Iron Works for the Department, I left for Oak Point and Vestfold, a small Icelandic settlement on the west shore of Shoal lake, which I reached on May 9.

I made some retracement surveys in township 19, range 3, west of the principal meridian, and also traversed parts of the lake affected by the lines resurveyed and by the recession of the water. This lake is drying up very fast, and its topography has greatly changed since it was first surveyed. Large tracts of land shown under water by the original survey are now converted into valuable hay meadows which are proving a blessing to the settlers who depend for their living on the dairying industry.

From Vestfold, I proceeded via the north end of Shoal lake easterly to Bender hamlet, a Jewish settlement situated near the Colonization road on the northwest quarter of section 36, township 19, range 1. All the houses, numbering about nineteen, are built in a row east and west along the road allowance on the north boundary of this quarter section, on lots averaging one hundred and forty feet wide by half a mile long. This arrangement has the advantage of keeping the colony together and forms the whole village into one family. A practically inexhaustible well has been dug beside the public road for the use of the whole colony, and it is of great benefit to the public who travel across this dry piece of country.

I understand that all these settlers have homesteads in the neighbourhood of the village. One of them keeps a steam gang-plough for the use of the whole colony, and as he is a blacksmith by trade, he is in a position to repair his machine which is often wrecked on their stony land. There is also a good store, a post-office and a boarding-house in the village, so that people travelling that way are sure to find some accommodation besides good well water, which is a rather scarce commodity in that country.

From this settlement, I drove along the Colonization road southerly to Cossette, and then followed another road southwesterly to the south end of Shoal lake, where I put in several days' work retracing blocks of sections in townships 15, ranges 1 and 2.

Along the Colonization road I noticed some very good farms, principally in the neighbourhood of Cossette, but in township 15 the land is low and gravelly and better adapted for stock-raising. The settlers I met are all doing well in that line by selling cream, cattle, &c.

From township 15, range 1, I proceeded to township 21, range 4, via Oak Point where I spent a day repairing the outfit and having the horses shod, reaching my new work on June 8. Here my survey consisted in the retracement of a few lines and the traverse of lakes which are not shown on the original plans. All these lakes connect



together in wet seasons by the flooding of the hay marshes which surround them, and form part of what is locally known as 'Island' lake.

From this township I drove westerly and northerly to township 22, range 6, driving for the latter part over a railway grade which lies within a short distance from the northeast corner of the township, which I had to renew. This railway grade is an extension of the Canadian Northern railway branch from Oak Point to Gypsumville. At present the gypsum mines and the winter fish trade are the chief revenue producers for this railroad.

From township 22, I came back along this same railway grade to township 21 where I branched off westerly following a road which led me to Scotch Bay via Pine View and Lily Bay, arriving at Scotch Bay on June 20. After spending a couple of days at that place traversing a small piece of lake Manitoba in township 21, range 7, I proceeded to township 22, range 8, which I reached on the 23rd. Here I spent three days retracing blocks of sections and then proceeded via the regular mail route along the east shore of lake Manitoba to Fairford settlement, where I arrived on July 1 and put in four days' work in the retracement of sections in township 30, range 9 adjoining the Indian reserve.

Fairford is an old Hudson's Bay company trading post, which up to the present time has practically remained unknown to farmers owing to its almost inaccessible position by land. The building of the Canadian Northern railway extension through this place should give it a chance to develop as there are tracts of good land suitable for mixed farming, and though the country is mostly covered with timber or scrub the fish business and the development of the gypsum industry should help to induce settlement in that direction.

From Fairford I drove back to "The Narrows" where I had left my sail-boat in the fall of 1909, and after transferring my supplies and camp equipage from the wagons to the boat, I sent my horses and wagons to Oak Point, and sailed at once to township 30, range 15, where I arrived on July 13. Here, again, I made retracement surveys which occupied ten days, and it was not until the 23rd that I could leave for Pine creek, via Waterhen river and lake Winnipegosis, which had been omitted at the time of the subdivision. I also surveyed a few miles of section lines.

Having completed the work at this point, I sailed back across lake Winnipegosis and down the first part of Waterhen river to the Indian reserve at Waterhen lake where, in order to ensure the safety of the trip down the lower part of the river, I hired an Indian to pilot the boat as far as lake Manitoba as the water was extremely low at that time of the year. I sailed across the lake to Elm creek, a small stream on the east shore in township 26, range 9, where I spent two days reinspecting two townships in Mr. Teasdale's contract of 1909 after which I returned to Oak Point. On August 23 I boarded the train at Oak Point with my party for Sprague, a station on the Canadian Northern railway southeast of Winnipeg, where I arrived on the same day. Here my work consisted in the retracement of one section in township 1, range 13, east of the principal meridian, but my work had to be trebled before a satisfactory closing could be obtained, and it was not until the 29th that I could finish the survey.

The inspection of part of Mr. Molloy's contract of 1909 kept me busy till September 8, and the next day I boarded the train at Culver for Beausejour, and from there proceeded to township 16, range 7, following a graded road which passed through many prosperous settlements.

I spent five days at this new place retracing lines in the vicinity of the Indian reserve, after which I moved camp to Hnausa, via Selkirk, reaching there on September 20.

Sixteen days were employed there surveying the east boundaries of townships 22 and 23 of range 3, which had never been properly surveyed before, and connecting



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the section corners on this outline with the nearest monuments on section chords in both ranges 3 and 4.

This work will prove a blessing to the settlers of that locality, a group of industrious Icelanders, who up to the present have made their living by fishing and a little farming which they increase every year. Owing to the land being heavily timbered the progress must be slow, but the land is very rich and, when it is all cultivated, this Icelandic settlement, on account of its situation near lake Winnipeg, and watered as it is by Icelandic river, will be one of the richest in the Province of Manitoba.

Inexhaustible, large, flowing wells of the purest water are found near the river at a short distance from its mouth on lake Winnipeg.

Large stores, butter factories, fish-packing plants and sawmills are found there, together with a flotilla of steamboats plying on lake Winnipeg.

From Icelandic river I moved to township 24, range 3, where I removed a witness mark wrongly placed on the road allowance, and established a new monument at the true corner after which I proceeded to township 24, range 2, west of the principal meridian where I made a similar correction. From there I returned to Oak point to procure new supplies before continuing further surveys west of lake Manitoba.

I proceeded next to townships 15 and 18, range 10, for the purpose of retracing blocks of sections in the former township which did not close in accordance with the provisions of the Manual, and to investigate in the latter township a section corner which was reported as wrongly marked. While there, I also surveyed a small piece of land in township 18, range 11 which had been omitted in the original subdivision. I then turned southerly to township 9, range 11, where I traversed a small piece of Assiniboine river which had also been left unsurveyed at the time of the subdivision. I might also mention the verification I made of the northeast corner of township 14, range 6.

After surveying one section line in township 16, range 12, east of the principal meridian, I left for Edmonton reaching there on November 11.

The surveys I made in Alberta comprise the traverse of lakes which had been omitted by contractors in different townships west of the fourth and fifth meridians, together with the survey of a few section lines across the beds of lakes in townships 45 and 46, ranges 16 and 17, which had dried up and are now converted into good hay land. I also verified and rectified the position of survey monuments in township 32, range 15, west of the fourth meridian.

These new surveys, though not extensive, occasioned much travelling and kept me busy up to December 15 when I closed operations for the season.



## APPENDIX No. 14.

## ABSTRACT OF THE REPORT OF G. H. BLANCHET, D.L.S

## MISCELLANEOUS SURVEYS IN THE RAILWAY BELT, BRITISH COLUMBIA.

After several days spent in organizing the party at Kamloops, we left for our first work in township 22, range 11, west of the sixth meridian, arriving there on April 16.

This township is crossed from east to west by Shuswap lake, the south shore of which is formed approximately by the centre line of the township. South from the lake there is a narrow fringe of low-lying land not exceeding twenty chains in width. Beyond this the land rises with varying steepness to an elevation of about seven hundred feet above the lake, the summit being about half a mile south of the lake at the west side of the township and nearly two miles from the lake shore at the east side. This slope seems to be well adapted to fruit growing, the soil varying from a clay loam to a sandy loam and gravel, and though surface water is scarce water is apparently easily obtained in wells.

Continuing south from the summit of the above-mentioned slope, a descent of a couple of hundred feet is made to the level of the Canadian Pacific railway main line. This slope is drier than the northern declivity, but the valley bottom is fertile and well watered, being probably best adapted to hay, grain, root crops and small fruits.

In the southern part of the township are to be found the lower slopes of the Black Hill mountain, which become high and rugged in the southwest corner. The lower slopes are well watered and seem suitable for any form of agriculture.

Good roads render all parts of the township easily accessible and the railway provides convenient commercial connections.

On the completion of the surveys in this township, I proceeded on May 27 to township 23, range 8, west of the sixth meridian, which was reached by a gasoline launch from Sicamous.

The portion of this township considered lies between the two arms of Shuswap lake, known as the "Long Traverse" and the "Sicamous Branch," which are joined by the Cinnemousun narrows. It has the appearance of a peninsula, the rib of which starts at the narrows and reaches a maximum elevation of about 1,500 feet above the lake in the southeast quarter of section 22. From here there is a rugged spur which continues south to the lake, making the easterly side steep and rocky. The main ridge, however, swings off to the southwest and, descending and broadening, forms a rolling upland with an elevation of about 1,300 feet in the southwest corner of the township. This small plateau and the declivities and benches by which it descends to the northwest, to the level of Shuswap lake, were the only portions considered to have agricultural possibilities.

The original rocky core is not very deeply buried at any point and frequently outcrops in bluffs and escarpments, most frequently in the northern portion. A seepage from the northeasterly slopes of the Bastion mountains supplies moisture, and although there are no permanent streams, springs occur at intervals, indicating a probable underground flow.

In the descent from the upper plateau level to the lake, two benches break the steepness of the slope. The first has an elevation of from 500 to 800 feet, and varies in width from over half a mile in the western side of the township to less than a quarter of a mile in section 21. The second bench extends back from the lake shore three-



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quarters of a mile in the west of the township and gradually narrows till it finally runs out altogether in section 20, beyond which the shore is steep and rocky.

As might be expected, the soil is almost everywhere rocky in the upper benches, being mainly of whitish clay, except in a few places where the humus has escaped the fires, which have destroyed most of the big timber. On the lower bench, however, the soil is mostly sand and gravel.

To render the higher lands, here considered, accessible for settlement, it is probable that a high-level road would have to be opened up. This could probably be done by extending the White lake trail eastward through township 23, range 9, to this township.

On the completion of the work in township 23, range 8, I moved the outfit to Canoe Point, section 29, township 21, range 8, where Salmon Arm branches off Shuswap lake. Here there is a low-lying bench already disposed of, on which excellent results have been obtained on a small scale in fruit, vegetables and grain. Back of this flat the ground rises rather abruptly towards the Bastion mountains. Portions of sections 30 and 32 on this slope were surveyed. The soil is, for the most part, a whitish clay with rocky outcrops and scattered fragments, except on the small flats where the humus has been able to accumulate.

An examination was made of township 22, range 8, which is crossed from north to south by Shuswap lake. On the easterly side the Shuswap mountains rise abruptly from the shore, which is, for the most part, extremely rugged, except about the mouth of Eagle river, where there is a small flat already disposed of. On the west side of the lake the conditions are very similar, the Bastion mountains forming a shore line inaccessible to the agriculturist, except in several places where large streams have cut gorges through the mountains, depositing the debris in miniature deltas, which have already been disposed of. A small bench of good land was found in the portions of section 32 and the northwest quarter of section 29, west of the lake. This was surveyed.

Proceeding by gasoline launch up Mara lake, portions of sections 2 and 3, township 21, range 8, were subdivided. The land here exhibited the general characteristics already described, the Hunters range forming the easterly shore of the lake, and only the lower slopes being suitable for agriculture.

I left Shuswap lake on August 18 for the lower Columbia river to undertake several surveys between Revelstoke and Arrowhead, in township 21, range 1, west of the sixth meridian, and townships 20 and 21, range 29, west of the fifth meridian.

Columbia river runs through the northeast quarter of township 21, range 1, west of the sixth meridian, the southwest quarter of township 21, range 29, and the northwest quarter of township 20, range 29, west of the fifth meridian, and the lands surveyed formed parts of the flats and the lower slopes of the mountains bordering the river. On the easterly side of the river the higher land backing the river flats is bare and rocky, but farther back there may be lands of agricultural value, now included in timber berths. The elevation of the river flats is, for the most part, sufficient to eliminate any danger of flooding by the river, while those portions liable to flood could probably be utilized as hay lands. The flats have been heavily timbered with large cedar, which are rapidly being converted into lumber. On the west bank of the Columbia the conditions are similar to those just described, except that the width of the flat is greater and that less of the timber has been removed.

The islands are for the most part merely overgrown sand-bars, flooded at high water. Water is abundant and of good quality throughout this portion of the Columbia valley.

On the completion of the surveys in these townships I moved to Revelstoke to survey timber berth No. 539, lying on the westerly slope of Mt. Mackenzie.

Up to this time the weather had been warm and remarkably fine, but the fall rains now commenced and continued with few interruptions until early in November.



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when the rain changed to wet snow. This weather caused much interruption to the work during the latter part of the season.

I next proceeded with surveys in township 23, range 2, west of the sixth meridian. Owing to the advanced season I considered it advisable to undertake the work on the hills on the west side of the river first. This work embraced the lower foot-hills of Mt. McArthur, which, though in places rough, contains a considerable quantity of agricultural land lying between the rock bluffs. Some of these valleys are old beaver meadows which would require draining.

The large timber has been burnt off, except on the upper slopes of the mountain, and in section 3, where a heavy growth of cedar, tamarack, fir and pine still remains.

The Provincial Government is building a road south through this part of the township, which is to form part of the proposed Revelstoke-Arrowhead road, and which will promote development in this district. There are many prospective settlers anxiously awaiting an opportunity to take up homesteads here, as the proximity of Revelstoke renders this a very desirable locality.

On the east side of Columbia river the conditions are somewhat different. Instead of the foot-hills, as on the west side, we have a series of three almost level benches, dropping sharply from one level to the next. The lowest of these benches includes most of section 1 and portions of sections 2, 11 and 12. It is much cut up by sloughs and is covered with cottonwood, willow and alder and in some parts cedar. It is probably best adapted for hay lands, and hay at the local price of from \$20 to \$35 a ton makes a valuable asset. It could also produce vegetables and grain on the higher ground.

The second bench, including most of section 14 and the southwest quarter of section 13, is probably best adapted for garden produce, hay and grain. The higher ground and the lower slopes of Mt. MacKenzie seem suitable for any form of agriculture, good fruit being raised here.



## APPENDIX No. 15.

## ABSTRACT OF THE REPORT OF M. P. BRIDGLAND, D.L.S.

TRIANGULATION SURVEYS IN THE RAILWAY BELT, BRITISH COLUMBIA, AND MISCELLANEOUS  
SURVEYS IN ALBERTA AND SASKATCHEWAN.

I left Calgary on May 31 for Golden and after a few days arranging for my party and outfit we proceeded to Revelstoke, and began field operations on June 8.

The first mountain to be ascended was mount Mackenzie, near Revelstoke. A camp was placed at the base of the mountain where the Canadian Pacific railway crosses Illecillewaet river, about two miles east of the town. The slopes here are very steep, but as the timber has been burned off and there is not much undergrowth, they offer an easy means of ascent. Much snow was encountered on the upper slopes. On reaching the summit it was too hazy to obtain any satisfactory view, but a cairn was erected in the position of the station occupied by Mr. A. O. Wheeler in his photographic survey of the Selkirk range, 1901-02. No permanent marks were made.

On our return to camp, one day was lost owing to wet weather, and then the party started for Carnes creek at the north limit of the railway belt. Mr. Carson's secondary cairns erected the previous year on Roseberry mountain and Carnes mountain were located, and a high peak to the northeast of them was climbed and selected for a station. Unfortunately, owing to the depth of snow on the summit, it was found impossible to erect a suitable cairn. This was done later during a prolonged spell of smoky weather. This mountain is about 9,800 feet above sea-level and lies to the east of the north fork of Carnes creek.

It is rather difficult to reach, but is the only peak in the vicinity suitable for a station. The view from here is magnificent, and typical of the Selkirk range, consisting of deep, narrow valleys, heavily timbered, and glacier-crowned peaks rising proudly from the dark green slopes below. Snow fields and glaciers are visible in every direction, and to the northeast that unclimbed monarch of the Selkirks, mount Sir Sandford, rises high above all others. This station was called signal XXXV.

Our next trip was to establish a signal on mount Copeland, a prominent peak up Jordan river and about fifteen miles northwest of Revelstoke. There is an old trail leading up this stream, but it had not been used for years and was in very bad condition, necessitating much cutting. The valley is from a quarter to half a mile in width, with very steep, rocky slopes on both sides. There is much excellent cedar and hemlock in the valley and on some of the lower slopes, and also a most luxuriant growth of fern and devil's club. We succeeded in getting horses about nine miles up the stream and were then compelled to send them back and proceed on foot, owing to the lack of pasture and the poor condition of the trails. From here we followed the Jordan, which turns north at this point, for about four miles. Here the old trail turns west up a narrow valley leading to some old mining claims. This trail we followed for about three miles through dense alder slides, and finally pitched camp about 500 feet above the valley on the north slopes of mount Copeland (9,700 feet), which we climbed the day following. A hole was drilled in the rock at the centre of the base of the cairn to receive the brass bolt usually used for marking stations, and a hole drilled for a reference bolt seven feet south. The cairn is five feet seven inches in diameter at the base and seven feet high, and was called signal XXXVII. This trip occupied in all nine days.



On returning to Revelstoke angles were read at the northeast corner of section 33, township 23, range 2, west of the sixth meridian, to connect the corner with mounts Mackenzie, Cartier, Begbie and Copeland. A trip was then made to the long tangent on the Arrowhead branch of the Canadian Pacific railway to find a suitable base for connecting mounts Mackenzie, Cartier and Begbie with the Dominion Lands surveys.

On July 3, a start was made for mount Begbie to the west of Revelstoke. Crossing Columbia river by the bridge at this point, we travelled south about four miles by means of a settler's trail. From here the horses were sent back and we proceeded on foot about three miles farther south to the base of mount Begbie. Camp was pitched at night on the side of the mountain about 2,000 feet above the Columbia valley. Much to our delight, the following day was fine and beautifully clear. The mountain offered no difficulty and we were on the summit by nine o'clock. A cairn was erected, five feet in diameter at the base and eight feet seven inches high. In the rock at the centre of the cairn a hole was drilled to receive the brass bolt and four holes, each distant six feet from the central hole and bearing north, east, south and west respectively, were drilled for reference bolts. This cairn was designated as signal XXXVIII. The trip to this mountain and return occupied only three days.

On returning from mount Begbie, preparations were at once made to visit the Incomappleux valley. Horses and outfit were shipped by train to Arrowhead and thence by boat to Beaton, a small village at the head of the Arrow lakes. From here an excellent wagon road leads up the river to the almost deserted village of Camborne, about six miles distant. On the way the road passes through a fine canyon about a mile in length.

Ten years ago Camborne was one of the busiest mining camps in British Columbia, but now there are only three or four families remaining. Four mills have been built, but they are all lying idle and one, at least, is in ruins. The country is all divided into claims, but no work, other than assessment work, is being done. The ore is chiefly quartz-bearing free gold, and some very rich samples were shown to us by people living there.

The valley above Camborne consists of a low flat about half a mile wide with steep mountain slopes on both sides.

The bottom-land appears very fertile and would yield good crops if cultivated. There is much excellent cedar and hemlock in the bottom of the valley and on the lower slopes.

On leaving Beaton, camp was taken to the mouth of Menhinnic creek, about one mile above Camborne. At this point there is a bridge across Incomappleux river, making it a very convenient base of operations for work on either side. On the west side of the river, a trail starts up Menhinnic creek and then turns across the mountain, leading to several claims high up on the slopes, the highest being the 'Burniere' near the edge of timber-line. This trail had been recently repaired and was in good condition. A good wagon road also leads up the west side of the river for several miles. About four miles above camp another trail leads up Sable creek to the Trilby basin. This is also a mining trail, but has not been used for some years and is in very bad condition. On the east side of the river there is a good trail for about twelve miles. There are also several branch trails, one at Camborne leads up Poole creek to 'The Silver Dollar' and other properties, about five miles farther up another trail leads up Lexington creek and a little farther on still another leads up the face of the mountain to a claim known as 'The Mammoth.' The main trail turns up Boyd creek, about twelve miles above Camborne.

Some difficulty was experienced in finding a suitable station in this locality as signal XXVII, which it was necessary to see from this point, was placed on a shoulder of North Albert peak. Eventually a peak about 8,000 feet above sea-level, a little to the northwest of Camborne, was selected. A cairn five feet in diameter at the



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base and eight feet seven inches high was erected. This was designated as signal XXXII. Two secondary cairns were also erected, one at the head of Trilby basin and another on Kelly peak, a high peak on the east side of Incomappleux river and a short distance above Kelly creek.

This trip occupied in all sixteen days. The weather was very warm and smoky, but it was singularly fortunate that the smoke cleared off every day we climbed.

Leaving Camborne, we next moved to Comaplix on the north shore of Arrow lake. This is a busy little lumbering town, the headquarters of one of the mills of the Bowman Lumber company. The smoke from a large fire across the lake was so dense that it was impossible to see any distance. Fortunately some heavy rains settled the smoke and we started for mount Sproat. Camp was taken by boat to a point about three miles west of Comaplix and thence up an old trail to a point about two thousand feet above the lake. Next day the summit was reached after a long and tedious climb. Owing to storms while on top it was impossible to do anything except build a cairn. This cairn was five feet six inches in diameter at the base, eight feet six inches high and was numbered signal XXXIII. During the ascent of this mountain we encountered on the upper slopes an old grizzly and two cubs. Next morning we returned to Comaplix, took the boat to Arrowhead and went by train to Revelstoke, reaching there on the evening of July 26.

On July 28, as it was very smoky with no indication of rain, we decided to revisit signal XXXV and erect the signal we were unable to build before. The signal was five feet in diameter at the base and eight feet two inches high. This trip occupied six days, during all of which time it was too smoky or cloudy to make any observations.

On our return to Revelstoke, we were again delayed some days by unfavourable weather. We then set out to place a signal on mount Cartier to take the place of the one formerly erected on mount Mackenzie, which had proved to be unsatisfactory. Horses were taken to the end of the road about five miles south of Revelstoke, and then the party proceeded on foot. The brush proved very bad and the distance greater than we had expected, so it was not until the afternoon of the following day that we reached timber-line below the peak. On the third day mount Cartier was ascended and angles read where possible. Owing to smoke and local thunder-storms no satisfactory results were obtained.

This station was called signal XXXIV. It was marked by a brass bolt cemented in a hole drilled in the solid rock. The bolt was stamped with the number of the triangulation station, followed by a triangle having its apex at the centre of the head of the bolt. For reference points two iron bolts were cemented in holes drilled in the rock six feet north and south respectively of the geodetic point. Surrounding the permanent mark, a conical stone cairn was built, five feet in diameter at the base, one foot six inches in diameter at the top, and eight feet high. The cairn was placed in the position of the photographic station occupied by Mr. A. O. Wheeler in his topographical survey of the Selkirk range, 1901-1902.

The return trip was made on the fourth day by way of what is known as 'the green slide.' This is a long open slope swept clear by frequent avalanches, and proved a very easy means of descent to the railway. From there we walked back to Revelstoke, a distance of about nine miles.

We next moved to Three Valley, a small lumbering town fourteen miles west of Revelstoke, to establish a station on Griffin mountain, leaving the pack-train at Revelstoke in charge of one of the men. Three days were lost through smoke and wet weather. On August 16 we started for the peak, commencing the ascent at a point on the railroad about a mile and a half west of Three Valley. Our path led up steep slopes which had been burned over many years ago and were nearly free from underbrush. Blueberries were found in great abundance. On reaching the summit of the ridge, we turned westward along the ridge until the highest point was reached.



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Here a disappointment awaited us, for we found that a slightly higher peak, some distance south and on the same ridge, cut out everything in that direction. Accordingly we turned back and followed the ridge to the other peak, which we reached about one o'clock, after a climb of nine hours. Further delay followed on account of clouds, and it was nearly six o'clock before we started for camp. Fortunately it was a fine moonlight night and we reached camp safely about half past nine.

This mountain (signal XXXIX) although low, is excellently situated for a station. It was marked by a hole drilled in the solid rock. Over this hole a cairn was erected five feet in diameter at the base, two feet in diameter at the top, and nine feet two inches high.

Craigellachie was then visited to ascertain the truth of certain rumours regarding a trail up the north fork of Eagle river and also of one up Queest mountain. We found that there was an old trail for about twenty miles up the north fork of the Eagle, but we could not find any up Queest mountain. The trail up Eagle river is rough and will require considerable chopping, but it will be very useful in establishing a station near the north limit of the railway belt north of that point. It was originally built by lumber companies in order to get some of their limits surveyed. As the weather was still unfavourable and feed scarce, it was decided not to bring the horses, but to move to Salmon Arm and make use of the bad weather to locate a base line.

On August 20 I went to Revelstoke and made arrangements for shipping horses and outfit to Salmon Arm. In the evening I returned to Craigellachie, and the following day moved to Salmon Arm. The remainder of the outfit did not arrive until August 23.

On the 24th a start was made for the Hunters range on the east side of Mara lake. Throughout this district good wagon roads have been built in all the principal valleys. We followed the Enderby road for about nine miles and then turned north to Mara. Crossing Shuswap river by means of the bridge at this point, we camped at Mr. Blurton's, near whose place an old Indian trail ascends to the summit of the range. As this trail was very nearly obliterated, I decided to get Mr. Blurton to accompany me for a few days.

The following morning we started for the summit of the range. Until an elevation of 4,500 feet was reached the trail led through green timber, chiefly small fir, poplar and willow. It then entered a tract of old brule where it was almost impossible to follow it, as it wound in and out among burned logs and fallen trees. After travelling through this for about three hours we reached the summit of the ridge. This summit consists of rolling benches with large open meadows and clumps of scattered spruce and balsam. Country of a similar nature extends from here to Griffin mountain above Three Valley, a distance of about twenty-five miles. Camp was pitched that night in a beautiful open meadow about three miles from the point where we first reached the ridge. Next day we travelled about ten miles farther north to the base of the highest peak on the range, about 7,300 feet above sea-level.

In the meantime the smoke had become so dense that it was impossible to see anything half a mile away. The peak was ascended and a cairn erected, but we were unable to decide whether or not it was suitable for a station. When the weather cleared some days later it was found necessary to place the cairn on a ridge about one mile south and about one hundred feet lower.

The station was marked by a hole drilled in the solid rock to receive the permanent brass bolt. With this hole as a centre the cairn was built, having a diameter of five feet six inches at the base and a height of nine feet six inches. The cairn is situated on the solid rock ridge affording an excellent location for permanent marks. This station was designated as signal XLII.

On September 3 we left Mara and moved down to Enderby, where we remained over Sunday. On Monday we started for Mabel lake, following a good wagon road



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which leads up the Shuswap valley to the lake, a distance of about twenty-four miles. There is considerable good land in the valley, but much of it is held in timber limits, which are not likely to be thrown open for settlement until the timber is taken off.

In order to reach mount Mabel we borrowed a boat from the A. R. Rogers Lumber company, and took a light camp to the mouth of Cottonwood creek. Here we found an old Indian trail leading to timber-line, and by means of this trail the ascent was made. There is some good cedar, hemlock and fir on the mountainside, but the slopes are so steep that it would be very difficult to get it out.

As time was short and loose rock was very scarce, a cairn was not erected. A hole was drilled in the solid rock to receive a permanent bolt and the butt of a tree eighteen inches in diameter and nine feet high was carefully centred and plumbed over the hole. This was securely braced and a piece of white cotton tacked around the upper end. This was designated as signal XLI.

Two days were spent looking up the position of some of the Dominion Lands survey posts in the vicinity and a secondary signal was also erected on Trinity hills, about half way between Mabel lake and Enderby, on the south side of the valley. This trip occupied eight days, during all of which time the weather was cloudy and showery.

On returning to Enderby, a secondary station was placed on a low rocky hill near the northeast corner of section 22, township 19, range 9, west of the sixth meridian. The party then moved to Salmon Arm, where much of the remaining time was devoted to work on the base line.

During a few days of fine weather, a trip was made to mount Ida. Considerable difficulty was experienced in finding a suitable station as the top of the mountain consisted of a rolling flat, heavily timbered. This made it necessary to visit practically every ridge on the summit. A sharp knob on the eastern side of the mountain was finally selected as a suitable point. This is not the highest part of the mountain, but it offers a good view in most directions and is the most favourable point for connecting with the ends of the proposed base in the valley.

Advantage was also taken of two or three fine days to visit Granite mountain and see if it would be possible to obtain a station thereon, from which the ends of the proposed base could be seen and also the peaks necessary for further expansion. It was found that the summit of this mountain consisted of a rounded rocky ridge heavily timbered with second-growth jackpine. A suitable point was selected on a shoulder about twenty feet below the summit and a temporary signal erected. Lines of sight were also cleared to existing signals and to some of the other peaks likely to be useful for stations.

During the last month of the season, much of the weather was too cloudy or smoky for work on the summits, and much of the time was spent trying to secure a suitable location for a base line. For this purpose a line a little over five miles in length was located, commencing on the east side of Salmon Arm of Shuswap lake, about one mile northeast of the town. From here it runs in a southwesterly direction, passing along the shore of the lake and through the Salmon Arm Indian reserve. This line was cleared out so that the ends were intervisible, but no attempt was made to prepare it for actual measurement.

On September 21, instructions were received to close work in the mountains as soon as possible, in order to attend to some miscellaneous surveys in Alberta and Saskatchewan. Accordingly on October 11 arrangements were made for shipping the horses and outfit back to Golden. Here the outfit was stored and the horses sent out to Mr. McKeeman's ranch, about thirty miles south of Golden for the winter.

During the season the work was greatly retarded by rain and smoke. During the interval from June 1 till October 10 it had rained on thirty-nine days and was very smoky and hazy on twenty-nine other days, a total of sixty-eight days out of one hundred and thirty-two. This does not include days on which the clouds were hanging low on the peaks, a condition almost equally unfavourable for work.



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The district around Salmon Arm and the Shuswap valley is in a very prosperous condition. Long ago, all the available land in the valleys was taken up for farming. Recently much attention has been given to fruit growing, and this has resulted in much land on the mountain slopes, formerly considered worthless, being taken up by settlers. The limits of the useful land are still being extended and it is impossible to say where cultivation will eventually cease. During the season of 1910, there was a very heavy crop of apples, pears, plums and small fruits, and nearly all the settlers engaged in fruit growing were enthusiastic about their success.

*Miscellaneous Surveys.*

On October 15, in accordance with your instructions of September 25, a small survey was commenced in the northeast quarter of section 18, township 24, range 1, west of the fifth meridian. This survey was completed on October 19.

Then, accompanied by one man, I went to Swift Current. Two correction surveys were made in this vicinity, one in section 2, township 18, range 14, and the other in section 9, township 12, range 12, both west of the third meridian.

On completing this work, I moved to Moosejaw. Here a resurvey was made of some of the lines in township 15, range 26, west of the second meridian, and some duplicate monuments destroyed.

On November 1, I moved to Moosomin where a survey was made in township 13, range 32, west of the principal meridian to ascertain which of some duplicate monuments were correct.

I next proceeded to Brandon, and thence to Forward, stopping on the way at Redvers to make a small correction survey in section 6, township 8, range 31, west of the principal meridian. At Forward two surveys were made, one a traverse of a lake in section 31, township 7, range 19, west of the second meridian, and the other a traverse of part of a lake lying in section 6, township 5, range 19, and section 1, township 5, range 20, west of the second meridian.

On November 13, I arrived at Moosejaw and received there instructions to make a survey of a lake in section 15, township 9, range 23, west of the second meridian. Accordingly I returned to Milestone and drove out to the above section. I completed this survey and returned to Milestone on the evening of November 16.

Leaving Milestone the same evening, I reached Maple Creek the following morning and made arrangements to drive out to section 21 township 7, range 29, west of the third meridian, where a survey was to be made of the old Northwest Mounted Police burial ground at the old site of Fort Walsh. This survey was finished and on November 20 we returned to Maple Creek. Transportation was furnished for this survey and every possible assistance rendered by the Mounted Police.

The following day we started along the Crowsnest line of the Canadian Pacific railway for Macleod. Three surveys were made along the line; one was a correction survey near Purple Springs on the east boundary of section 17, township 10, range 14, and the second was a retracement survey on the correction line between townships 10 and 11, range 19, both west of the fourth meridian. The third was a traverse of Belly river in sections 13 and 24, township 9 range 23, west of the fourth meridian. The north bank of the river through these sections was traversed, but owing to the river being partly frozen and full of floating ice, it was found impossible to cross to the other side.

On December 1 and 2, a traverse was made of a lake lying in section 4, township 21, range 27, west of the fourth meridian, and then I returned to Calgary where a traverse was to be made of Bow river through township 24, range 2, west of the fifth meridian. This was completed on December 9.

I then went up to Didsbury and made a small correction survey near there, on the north boundary of section 11, township 31, range 1, west of the fifth meridian.

On returning to Calgary some additional work was done in the northeast quarter of section 18, township 24, range 2, west of the fifth meridian, and on December 15 I closed work for the season.



## APPENDIX No. 16.

## REPORT OF E. L. BURGESS, D.L.S.

## MISCELLANEOUS SURVEYS.

OTTAWA, March 15, 1911.

E. DEVILLE, Esq., LL.D.,  
Surveyor General  
Ottawa.

SIR,—I have the honour in accordance with my instructions to submit the following report on the miscellaneous surveys which I made during the past year.

On Sept. 3, 1910, I received instructions to survey the ordnance lands lying in lots 39 and 40 of the first concession, Ottawa front, township of Nepean, now within the limits of the city of Ottawa.

The survey was proceeded with immediately. After locating the boundaries of these lands I produced Bell street, Division street, LeBreton street and Rochester street through them to Carling avenue and submitted a plan showing these streets as well as the topography and the improvements on the land. I was then instructed to prepare a method for subdividing the land into city lots. This was done and the lots subsequently marked on the ground.

At the completion of the survey on Nov. 30, I received a message from J. P. Dunne, Esq., of the Ordnance Lands Branch, stating that the Deputy Minister of the Interior had ordered the work to be stopped as the Ottawa Improvement Commission was negotiating with the Department for the property in question. As no decision has been arrived at so far as I am aware as to the disposal of the property no further action has been taken in connection with the survey.

On Jan. 14, 1911, I received instructions to locate the contour line from the spillway of the dam then being erected on Sturgeon river by the Municipality of Fort Saskatchewan in section 22, township 55, range 22, west of the fourth meridian and to traverse Sturgeon river from its mouth across sections 21 and 22 connecting with the traverse the dam and power works and to survey the boundaries of section 22. The chief object of the survey was to determine whether any lands other than those owned by the municipality would be flooded by the dam. It was found that a considerable area of land in sections 27 and 28 which I believe are not owned by the municipality would be so flooded. Sturgeon river was, therefore, surveyed across these sections and the extent of the area required for flooding purposes determined.

I was engaged in the field on this work from January 20 to February 6. My party consisted of two labourers.

I have the honour to be, Sir,

Your obedient servant,

E. L. BURGESS, D.L.S.



## APPENDIX No. 17.

## REPORT OF ALAN J. CAMPBELL, D.L.S.

## EXAMINATION OF LANDS IN THE RAILWAY BELT, BRITISH COLUMBIA.

CALGARY, ALBERTA, February 24, 1911.

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa.

SIR,—I beg to submit herewith my report regarding the operations of my parties engaged in the examination of undisposed of lands in the New Westminster district of the railway belt of British Columbia.

In accordance with your instructions, received through Mr. A. O. Wheeler, D.L.S., I took charge of the examination of lands in the New Westminster district. Two parties were placed in the field, one in charge of G. A. Bennett, D.L.S., worked in the Chehalis and Harrison lake country and northward along the Fraser valley, while the other in my charge worked in the vicinity of Stave, Lillooet and Pitt lakes and westward. The report of Mr. Bennett, giving details of his operations, is submitted herewith.

I left Calgary on May 12 and proceeded to Vancouver, where I procured my outfit. It was thought advisable, as there were so many lakes lying in the country to be examined, to provide the parties with canoes for the purpose of transporting the camp outfit, and for use in working around lakes. Two Peterborough canoes were purchased for each party and were found of great service.

The examination of lands was commenced on May 19 at Nicomen and the lands in the vicinity of that place and of Dewdney, including the valley of Suicide creek, were gone over.

On May 28, Mr. Bennett arrived and I immediately proceeded to Vancouver to procure for him the necessary outfit and supplies and also to hire men. In the meantime he was in charge of my party and was carrying the work forward. On June 2 Mr. Bennett took charge of his party and started on the examination of lands at Nicomen, working from there eastward.

By June 1 the lands in the vicinity of Nicomen and Dewdney were completed and the party proceeded with the work of examining the lands in the vicinity of Durieu or Hatzic Prairie. This was completed by the 14th and a move was made to the vicinity of Stave lake. Between June 15 and July 9 the lands around the south end of Stave lake and those lying in the vicinity of Stave river were examined, the latter being reached by flying camps. There being no survey posts on the west side of Stave lake and being unable to locate more than a very few of those on the east, it was necessary to make a traverse of the lake so as to be able to describe the lands adjoining the lake by sections and quarter sections. Accordingly a traverse was run along the west side of the lake and up North Stave river and for some distance up Cypress and Clearwater creeks. The lands in the vicinity were also examined and the work around Stave lake was finished on July 28.

I had intended to move the camp across the ridge between Stave and Lillooet lakes, but on exploration found that it would be just as expeditious, if not more so, to reach the Lillooet lakes by moving down to the Fraser and going in from Haney. Accordingly we moved down to Stave falls by canoe, and, by the kindness of the superintend-



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ent at the power works there, were allowed the use of a team to transport the camp to Ruskin. From Ruskin we moved to Haney via Fraser river, and from Haney by wagon to Lillooet river.

The period from August 2 to 11 was spent looking over lands in the vicinity of Lillooet river and camp was then moved to Lillooet lake. The river being unnavigable, it was necessary to pack the camp outfit on our backs.

During this period I visited Mr. Bennett's party to see how he was progressing and to make arrangements for future work.

There being no survey posts in the neighbourhood of Lillooet lake, it was necessary to make some surveys. This was done by traverse and by carrying a system of triangulation up the lake, the lands being examined by lines run from the traverse points. The time between August 12 and September 7 was occupied in this work and in the exploration of Gold creek valley.

The lands on the southerly slopes between Lillooet river and the North Lillooet and across to Pitt meadows were then examined. This work was finished on September 30, and a move was then made to the Pitt lake country and the examination carried on in that region and in the vicinity of Pitt river, which was completed on October 28. The period from October 29 to November 8 was spent in examining the lands to the east of Coquitlam river, and from November 9 to November 15, those on the west side of the river.

On September 28 rain started and fell nearly steadily until October 8; from then the weather was very unsettled and it rained at frequent intervals, making the work on which we were engaged very disagreeable. On November 16 the party moved to Westminster Junction and the men were paid off. Mr. Bennett's party came in on the 17th and was also paid off.

Mr. Bennett and I spent a day at Vancouver collecting data as to lands disposed of and we then started for Calgary arriving there on November 20.

The following methods and instruments were used in conducting the examination. If the lands lay within surveyed territory, the survey lines were traced and auxiliary lines run to gather sufficient information to make a complete report of the lands examined. In unsurveyed territory triangulations, traverses and approximate production of the township subdivision lines were made so as to collect the necessary information regarding the lands examined.

For triangulation work, transit instruments were used, and for traverses a transit surveying compass, a sixty-six foot chain, and a stadia rod.

In the land examination direction was kept by military pocket compasses and distance measured by chain, stadia hand-levels and by pacing with the assistance of a tally register. Elevations above sea-level were obtained by aneroid barometers which were carried by the examiner. The travelling barometers were checked for fluctuations due to changes in the atmospheric pressure by the readings of a stationary barometer at camp, these readings being taken every hour. The elevations above sea-level were obtained from elevations along the Canadian Pacific railway by James White, Geographer. The stationary barometer readings were checked with these elevations wherever possible.

I have the honour to be, Sir,

Your obedient servant,

ALAN J. CAMPBELL, D.L.S.



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## REPORT OF G. A. BENNETT, D.L.S., ON OPERATIONS IN EXAMINATION OF LANDS IN THE NEW WESTMINSTER DISTRICT.

CALGARY, ALTA.

February 21, 1911.

ALAN J. CAMPBELL, Esq., D.L.S.,  
CALGARY, ALTA.

SIR,—I have the honour to submit the following report on my season's work of examining lands in the New Westminster district of the railway belt.

On May 23, in accordance with a letter of instructions from the Surveyor General dated May 18, I started for Nicomen, British Columbia, where I was instructed to meet you. I arrived at Nicomen on the 28th, and finding that you had moved to Dewdney, proceeded there the same day and joined your party. On June 2, with arrangements completed for putting my party in the field, I returned to Nicomen, met the three men you had hired in Vancouver and prepared to make location surveys for the examination of township 24, east of the coast meridian.

Using Nicomen slough and later Harrison bay as a base, the country was examined eastward to the mouth of Chehalis river and finished by June 25. Finding it impossible to use the canoes on Chehalis river the party packed the camp equipage up the Chehalis valley, and completed the surveys and classification of that district on July 29. Using the canoes, Morris lake was then visited and the country adjacent to it was examined, including the lands in the vicinity of Weaver lake. Completing this work on August 3, the party moved to Harrison lake and began the examination of lands on the western side of the lake. These lands, including the islands in the lake were classified by the 23rd and then the party crossed the lake and, beginning with Silver creek valley continued southward the examination of the lands accessible from the eastern shore of Harrison lake. Completing the examination of all lands adjacent to Harrison lake and Harrison river by September 19, the party returned to Fraser river and resumed the work of examining eastward on the north side of the Fraser valley.

In order that the party might safely and expeditiously take the canoes up the riffles of Fraser river an Indian canoeman was engaged. However, because of the heavy continuous rains, which fell during the first two weeks of October, the work of examination was delayed and the river navigation made difficult so that the party did not complete the work to Yale until October 18. To travel farther up the river with the canoes was now impracticable, the high water making the rapids in the canyon above so dangerous that no boat could possibly survive.

On account of the difficulties of transportation in this region, the party now crossed Fraser river and examined the portion of township 6, range 26 and township 7, range 25 east of the river. Therefore it will be unnecessary for another party to come farther up Fraser river than Hope when examining the lands south of the river.

Completing the work in the neighbourhood of Yale by October 25, the camp equipage was transported to Spuzzum by freight. From here surveys were made connecting with those from Yale and the lands in the neighbourhood examined including the Spuzzum creek valley and the lands east across Fraser river consisting of fractional range 26 and township 8, range 25. On October 31 the camp equipage was shipped via Canadian Pacific railway to China Bar and from here lands were examined up to the north limit of the Coast division including the Scuzzy river valley and lower Anderson river valley.

Winter had now begun to set in. From October 1, when the rainy season began there had been almost continual rain which now changed to sleet and snow, and covered the uplands to a depth of from six to ten inches. These weather conditions



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made work such as the party were engaged on very disagreeable, as much of the time had to be spent in flying camps up in the mountains.

The examination of the country to the west of Fraser river in the Coast division was now completed, as well as of lands east of Fraser river, north of township 5, which could be conveniently reached without the assistance of packhorses.

On November 10 the party started for Westminster Junction travelling by railway to Yale, then by canoe down Fraser river to Pitt river where the canoes were stored, and reaching Westminster Junction on the 17th the party were paid off.

After spending a day in the Lands Office at New Westminster gathering data about lands disposed of, I started for Calgary, reaching there November 20.

I have the honour to be, Sir,

Your obedient servant,

G. A. BENNETT, D.L.S.



## APPENDIX No. 18.

## ABSTRACT OF THE REPORT OF P. A. CARSON, D.L.S.

## MISCELLANEOUS SURVEYS IN SASKATCHEWAN.

The miscellaneous surveys on which I was engaged throughout the season were very varied in their nature. They consisted in locating, and correcting where possible, errors in original surveys; reconciling seeming discrepancies in the returns of old surveys; restoring and reestablishing obliterated and lost monuments; determining the areas of small lakes evidently overlooked in the original survey; traversing lakes or rivers whose beds or channels have sensibly altered since the original survey; surveying the beds of a number of prairie lakes which have dried up and conceded many acres of valuable hay and farming land; investigating all manner of communications received by the Department from settlers with reference to surveys. When such matters are brought to the notice of the Department, it is necessary in many cases to investigate the true condition of affairs on the ground, and it has been found that time and money are saved by sending, instead of a whole survey party, merely a surveyor and assistant, who can easily make the necessary investigations and in most instances perform any small surveys required.

The year 1910 was a remarkably dry year, due to the light snowfall of the preceding winter and the drought of the spring and summer. Lakes and sloughs, which during previous years were full of water, were, in 1910, perfectly dry, and produced great quantities of hay. In some cases the dry beds seemed suitable for agriculture and many applications were received for these lands. The question was to decide whether the dryness was a permanent condition or only due to the abnormal drought. The real old timers in some of the districts where this condition of affairs existed affirmed that the wet and dry seasons go in cycles, that they had seen the same dry state before, some fifteen or twenty years ago, and that, if the winter of 1910-11 brought an abundance of snow, these lakes would fill up again. Others claimed that the climate of western Canada was changing, due to the tilling of the soil, that the amount of rainfall is decreasing each year, that the ploughing and growing of crops on the land surrounding the lakes prevented the moisture from seeping to the low levels, and that cutting the hay from the beds allowed the water to dry off more quickly.

From my personal observations I have formed a rather qualified opinion on this subject. In some districts, particularly where the land is fairly level and open, many shallow lakes are at present dry, and I believe will remain so. On the plan of township 37, range 25, west of the third meridian, are shown eight lakes. These must have contained water at the date of survey, July, 1904. In October, 1910, there was not a drop of water in the township, except in lake No. 8, where only a muddy pond of ten acres remained. Some portions of the old beds have been broken and tilled, others are producing hay. In the bed of lake No. 1 which covered nearly a thousand acres in sections 24 and 25, I saw a field of flax yielding between fifteen and twenty bushels to the acre. Similar conditions exist in several neighbouring townships. I believe that the majority of these lakes will remain dry, and even those which contain water at wet seasons will produce hay in the late summer, and should not be excluded from the quarter sections as being useless.

There are, however, a number of lakes which, although at present dry, will probably revert to their normal condition during wet years, for example, Grass lake,



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in townships 37, ranges 23 and 24, west of the third meridian. This lake is four miles long and a mile wide. The banks are from ten to thirty feet high, and the surrounding country is rolling prairie. Although some of the neighbouring land has been broken and tilled, and enormous quantities of coarse hay have been cut from the dry bed, I see no reason why Grass lake will not again contain water. For this reason and as the soil of the bed is of a muck-like nature, the lands of Grass lake will be useful only for haying purposes. Muddy lake in townships 38 and 39, range 22, west of the third meridian is a somewhat similar case, but in this, as in most alkaline lakes, a deposit of alkaline mud lessens the value of the land for hay. The waters of Kill-squaw lake in townships 39 and 40, range 22, west of the third meridian have receded greatly since the subdivision survey in 1903. Many acres formerly covered by this lake are now arable, many more are hay producing, while unfortunately in some quarter sections foxtail, or wild barley has grown so luxuriantly that any useful growth is smothered.

These are but a few of the numerous cases of a similar nature each of which must be investigated individually to be dealt with at all.

In addition to the miscellaneous surveys, observations were taken at the different localities for magnetic declination, dip and total force, these observations not materially retarding the regular work. One hundred and sixty observations for magnetic declination were obtained, with a Bausch and Lomb trough compass attached to the standards of a Watts transit. The index correction of the compass was determined at the Agincourt magnetic observatory, both at the beginning and the end of the season.

The observations for dip and total force were made with a Dover dip circle, according to Lloyd's method. Two complete observations for each were taken at twenty-three stations. The constants of the dip circle were determined at Agincourt, both at the beginning and the end of the season.

Observations were also taken for the diurnal variation of magnetic declination on several days during the summer. The diurnal variation was also observed every day during the month of November at Rosthern, Sask., in township 42, range 3, west of the third meridian, simultaneously with another observer stationed at Athabaska Landing, Alberta. My assistant observed for diurnal variation and as well for dip and total force.



## APPENDIX No. 19.

## ABSTRACT OF THE REPORT OF WM. CHRISTIE, D.L.S

## SURVEY OF PARTS OF THE EIGHTEENTH AND TWENTIETH BASE LINES WEST OF THE FOURTH MERIDIAN.

During the winter I arranged to have my season's supplies forwarded to Cold lake, and on May 9 I left Prince Albert for the survey by way of Lloydminster. With my party I reached Cold lake on May 20, and proceeded thence by the wagon road around the west shore of Cold lake and Primrose lake to the intersection of the meridian and the eighteenth base. We commenced work on May 31, leaving our wagons behind and moving all the season by pack-train. The work was pushed vigorously ahead and on August 17, we reached range 13, to which point the base had been previously established.

We then started back over our own trail and reached the fourth meridian August 26. We then followed the trail made by Mr. J. N. Wallace when surveying the fourth meridian and arrived at the intersection of the twentieth base, September 5. We surveyed this base across nine ranges, and, on October 31, our supply of oats being exhausted and forage being poor, we closed operations for the season and arrived back in Lloydminster, November 28.

The country along the first six ranges of the eighteenth base consists of sandy ridges covered chiefly with jackpine together with some poplar and small spruce, alternating with large muskegs and tamarack swamps. There are practically no hay lands, the only grass found being around some of the lakes and along a few creeks. The soil on the ridges is mostly light and sandy. Most of the swamps can be easily drained and converted into good agricultural lands.

Across ranges 7, 8 and part of 9, the country is more rolling but contains many swamps. The soil is better and is covered with poplar, spruce, jackpine and brule. A stream, one hundred and twenty feet wide and three feet deep, crosses the line in section 35, range 8. Its valley is from one-half to three-quarters of a mile wide and seventy-five to one hundred and thirty feet deep. Some good clumps of spruce and poplar occur on the slopes of the valley. Several small creeks flow into this stream in the vicinity of the base line. Along most of these and also along the main stream good grass is to be found.

Across the remainder of range 9 and range 10, the country is high, rolling, and heavily timbered with poplar up to sixteen inches, spruce up to twenty-four inches and some birch and jackpine. The soil is good, consisting of black loam to a depth of six to ten inches on a subsoil of clay. Touchwood lake, which lies in townships 66 and 67, ranges 9 and 10, drains into Beaver river and Heart lake in townships 70, ranges 10 and 11, and ultimately to the Athabaska. Both lakes abound in whitefish.

The line in ranges 11 and 12 crosses rolling country, but the hills are lower than in the more easterly ranges, and there is considerably more swamp and muskeg. The timber is mostly poplar, spruce and birch up to eight inches. A wagon road from lac la Biche to Heart lake crosses in range 11, and on the west shore of Heart lake there is a small settlement of Indians and half-breeds. They grow potatoes and vegetables successfully and have a number of horses. The land in this vicinity is very lightly wooded and can be easily cleared.



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The country crossed by the twentieth base line is of much the same character across the nine ranges. The general slope is to the north and the surface is rolling, consisting of ridges covered with spruce, jackpine, poplar and a little birch, alternating with spruce and tamarack swamps. The timber seldom exceeds eight inches and nowhere is it of commercial value ; but there is everywhere sufficient for the needs of settlers. All the swamps can be easily drained and will make good agricultural lands. Little hay was found.

Buffalo river flows east across the line in range 1 ; there is a little grass along its banks. Winefred river crosses in range 3, flowing northeast from Winefred lake in townships 75 and 76, ranges 4 and 5. The banks of the stream are low and swampy. Winefred lake is said to abound with whitefish. There are a few Indians at the lake who grow a few potatoes that appear to do well.

The pack-trail from Heart lake to McMurray crosses the line in range 3.

A lake, about eleven miles long and averaging one and one-half miles wide, lies close to the line in townships 76, ranges 5, 6 and 7. Whitefish and jackfish are plentiful in this lake. The outlet is at the west end by a creek which flows to Pembina river, about six miles to the north. There is a number of old houses at the west end, but only one Indian, with his family, now lives there.

A small lake just north of the line in range 7 is surrounded by a narrow strip of good hay meadow.



## APPENDIX No. 20.

## ABSTRACT OF THE REPORT OF A. L. CUMMING, D.L.S.

## SURVEYS AROUND BRULE LAKE, SOUTHWESTERN ALBERTA.

Leaving Edmonton on May 6, we went by the Grand Trunk Pacific railway to Wolf Creek, and from there by trail to the fourteenth base line, north of Brule lake. We crossed McLeod river at Wolf Creek and Athabaska river at Prairie Creek, both rivers being at high water.

After building two caches, one at Prairie Creek and another near our work, we commenced on June 1, the subdivision of township 52, range 26, west of the fifth meridian.

Subdivision work was also performed in townships 49, 50 and 51, range 25, and township 51, range 26, after which Athabaska river was traversed from township 50, range 27, west of the fifth meridian to township 47, range 1, west of the sixth meridian.

The part of the Athabaska traversed lies wholly within the Jasper Forest Park reserve. Township 47, range 1, west of the sixth meridian, is reached by the freight road along the Grand Trunk Pacific railway.

It is a first-class wagon road and heavy loads can be hauled over it. The Athabaska ferry crosses the river approximately in section 14, township 48, range 28, west of the fifth meridian, and from there the road follows the left bank of the river. The soil along the river is mostly a sandy loam with sand subsoil, but in places is rocky, the rock being a hard bluish limestone. The banks are not very high and are covered mostly with good spruce running from fifteen to twenty inches in diameter. Athabaska river is a large swift-running stream, varying in width from one hundred yards to almost a mile, where it expands into Jasper and Brule lakes. The river was not frozen over at the time of traverse in December, because the current is swift and the Chinook winds play havoc with the ice that forms. The ice was sufficiently formed along the banks to permit us to do most of the traverse on the river, and we were compelled to work on the shore only where points jutting out allowed no ice to form. The first expansion of the river going down stream is Jasper lake, which is about one mile wide and six miles long. A very large lake about five miles long runs almost parallel to Jasper lake on the right bank, being separated by only a narrow ridge of land. At the outlet of Jasper lake going down stream there is a beautiful archipelago containing islands of all sizes which are covered with good green spruce, and at high water the larger islands appear as a number of smaller ones, while a great number of gravel bars are to be seen at low water. The river runs through a very pretty valley varying from one to four miles in width. Again there are places where this valley is broken by the foot-hills rising at the edge of the river, and consequently narrowing the river very much at these points. Water-power might be developed by damming the river at those points, but very little could be done without seriously interfering with the Grand Trunk Pacific grade which is very close to high-water mark. The scenery in the park is magnificent, the snow-capped peaks of the Rocky mountains forming a striking contrast to the peaceful green valley of the Athabaska. Bullrush mountains and roche Suetie on the left bank, and the Folding mountains, roche Miette and roche Jacques on the right bank within three miles of each other, appear to tower over the river.

Finishing the traverse on December 28, the party returned to Edmonton, arriving there on January 3, 1911.



## APPENDIX No. 21.

## ABSTRACT OF THE REPORT OF W. J. DEANS, D.L.S.

## SURVEYS IN THE RAILWAY BELT OF BRITISH COLUMBIA

I arrived at Notch Hill on May 3, 1910, whence I proceeded to township 22, range 10, west of the sixth meridian.

My first work consisted of the surveying of part of this township into half legal subdivisions. These lands extend to the shore of Blind bay on Shuswap lake and vary in height from a few feet to 1,300 feet above the lake. Most of the land in the area subdivided is classed as bench land though in some places there are quite large level tracts, and in other places the land is broken by ridges and ravines. The soil generally on the flat land is clay, while on the broken land it is a clay mixed with sand and gravel. The whole surface, except where burnt over by fire, is covered with a thick growth of small poplar, birch and willow, with occasional clumps of fir which have been left by the lumbermen owing to the difficulties of getting the logs out. There are four small lakes containing good water. As all or most of the land surveyed by me was in a timber berth, there are numerous lumber roads and trails throughout the whole tract. There is, also, a good road from Notch Hill station, running through the township. These roads and trails make travelling easy and the market for produce can at all seasons be reached without difficulty. I am told by the settlers that the heavy clay land will not produce satisfactory crops until it has been sown with white clover; this seems to restore to the soil all the elements necessary for successful production. I saw a few small apple orchards, which had been planted on this clay soil prepared first by sowing clover, and, although the trees had only been set out two years, they were in a very healthy condition and gave promise of development into a producing orchard. I saw a five-acre apple orchard at Notch Hill station, the trees of which consisted of well-known winter varieties, and had been set out two years. The owner bought the land at fifty dollars an acre. He was well pleased with his venture, and felt sure that the climate and soil were well suited to apple production. This land is similar to the lands I subdivided, and I have no doubt that most of the land surveyed in this township is well adapted to the cultivation of apples, cherries and berries.

These lands are also well adapted to the production of garden vegetables. I saw many small gardens, and although the land did not seem to be in a high state of cultivation, yet the vegetables would be hard to excel.

Timothy yields well on the lower levels, and heavy crops of oats are grown.

The rainfall during May, June and part of July was sufficient for agricultural purposes, and although we had frosts in May and June, yet they were not severe enough to do any damage to grain or vegetables.

There are many ideal camping places in this township along the shores of Shuswap lake. A beach of sand and gravel extends fifty feet back from the water, and from there the land rises in a gradual slope. The ground is carpeted with a thick growth of grass and creeping vines and is wooded with large fir and cedar. Bears and deer are to be found in the forest, while the lake abounds in fish. Plenty of pure water is to be found in the numerous mountain streams. My last work in the township, which was finished on July 12, was near White lake. The land near the lake is covered with a heavy growth of fir and cedar, some of them thirty-six inches in diameter. Fire has done some damage around the lake and the fallen timber makes it difficult to travel.



On July 13, I hired a gasoline launch and moved the outfit to township 24, range 8, west of the sixth meridian. This township is situated on the shores of Seymour Arm, a part of Shuswap lake. On July 15, I started to run the north boundaries of sections 3, 2 and 1, which form part of a reservation to the south. This line extends from the lake shore up the side of a steep mountain and attains a height of 2,200 feet above the lake. Then there is a flat of some twenty chains and then the line descends to the west shore of Anstey Arm. The surface of the mountain on the west side near the lake is covered with fir, poplar and cedar from ten to twelve inches in diameter, while farther up the mountain the trees are small and scattered, with clumps of poplar and hemlock scrub. On the top of the mountain, the timber consists of fir, hemlock, and birch, from eight to ten inches in diameter, with hemlock scrub. On the east slope of the mountain the timber is generally small, except in a few places where the fir and hemlock attain a diameter of from twelve to sixteen inches.

The soil along the north boundary of this reservation consists of sand and stones, with patches of rock. There are a few places where the soil is clay, but the area is very small. I do not consider the lands adjoining the north boundary of this reservation on either side of any value for agricultural purposes.

On July 19, we moved the outfit up Seymour Arm to the north boundary of section 15. My work here consisted in subdividing a strip of land lying between the north boundaries of sections 15 and 35 and extending back from the lake shore for a distance of about a mile and a half. The shore of the lake had been traversed and monuments erected at section corners. Generally speaking, the whole of this tract rises very abruptly from the lake to a height of 400 feet, then in short benches until a height of from 1,200 to 1,600 feet is attained at a distance of a mile from the lake shore. There is a large portion of this tract which in my opinion is suitable for the cultivation of apples, cherries and berries. Wild berries grow in great abundance, attain a great size and have a splendid flavour. The soil in this part is mostly clay, gravel and sand, with large patches of bare rock in many places. The surface near the lake is covered with fir, poplar, birch and cedar, from six to twenty-four inches in diameter. Most of the large fir which we cut down were rotten at the heart, while the cedar were only shells. The surface a mile back from the lake is largely covered with a thick growth of small hemlock with occasional clumps of fir. The soil where these small hemlock grow consists of loose rock, covered with moss and an inch or two of soil. I did not subdivide the east half of section 23 nor the west half of section 25, township 24, range 8. I do not think that these lands are of any use for agricultural purposes. The soil is largely composed of loose rock and moss on which there is a thick growth of small hemlock scrub.

I completed the subdivision of that portion of township 24, range 8, lying along Seymour Arm, and on August 23, moved the outfit by gasoline launch to Anstey Arm, camping on section 12. I subdivided the northeast quarter of section 12 and the east half of section 13, thus completing all the subdivisions which I had to make in township 24, range 8. The land in sections 12 and 13 slopes gradually up from the lake to a height of 400 to 800 feet. The surface is covered with a thick growth of poplar, fir and cedar, from three to six inches in diameter; there are numerous ravines in section 12, which cut the land up badly and the soil is clay with gravel and loose rock covered with moss along the north side of the section.

The east half of section 13 contains some good land which slopes towards Anstey Arm; the soil is clay and sand with gravel and patches of rock in places, and the surface is covered with a thick growth of small spruce and birch, with thick underbrush. To clear this land would entail a good deal of hard work, but it would amply repay the settler when under cultivation. I subdivided section 18 and part of 19 in township 24, range 7. These sections slope sharply towards Anstey Arm and are covered with a thick growth of bush, with scattered fir, cedar, poplar and birch, eight to ten inches in diameter. The soil is clay and gravel with patches of rock.



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On September 9, I moved the outfit with two small rowboats across Anstey Arm to section 8. My work in this locality was to subdivide the land lying along the shore of the arm between the north boundary of section 7, and the south boundaries of sections 5 and 6. I completed the subdivision of this tract on September 21, and moved camp to section 35, township 24, range 7. The work in the township was finished on October 15. Most of the land which I subdivided along Seymour and Anstey Arms is well adapted to apple and berry production. The soil is suitable, the rainfall sufficient, and I think there are no severe summer frosts. The land is accessible by boat, the greater part of the year. Sicamous Junction, a station on the Canadian Pacific railway, is within eighteen miles, and from this point a number of steamboats and gasoline launches make trips to different parts of the lake. Farm produce and vegetables are very high in price, the local demand at all times being much in excess of the supply.

On October 15, I moved into Sicamous on my way to the Columbia river valley. I arrived in Golden on October 16, whence I moved the outfit by team to section 3, township 26, range 21, west of the fifth meridian.

Golden, situated on the main line of the Canadian Pacific railway near the junction of the Kicking Horse and Columbia rivers, contains about 800 inhabitants. It is an important railway point, and it is also the headquarters of a large lumbering company. There are a number of churches in Golden and also a good school. The town is lighted by electricity and has an efficient fire brigade. The lands in the vicinity are fertile and when settled and cultivated Golden will become a thriving centre. There is a steamboat which sails from Golden to the head waters of the Columbia river and does a large trade in passengers and freight. There is also a good wagon road, running south in the Columbia river valley to Fort Steele. The Kootenay Central railway have a portion of their road constructed.

My work in the Columbia river valley was to survey three timber berths and subdivide agricultural lands in townships 25 and 26, range 21, west of the fifth meridian. I had a great deal of trouble and hard work to get my outfit up to the northeast corner of section 4, as this point is about 800 feet above the Kootenay road. I surveyed timber berth No. 542 from this camp and ran all lines within a reasonable distance. On November 17 I divided my outfit, leaving half camped on section 26, township 25, range 21, while the other half went up to survey timber berth No. 541 and camped near the east boundary of section 36, and as this land is fairly good for agricultural purposes I laid it out in legal subdivisions. The timber will probably be cut off inside of two years, when the land will be available for settlement. The Columbia River Lumber company have about sixty men working on timber limit No. 421 and expect to cut not less than 3,000,000 feet. The same company have also a camp on section 10, township 26, range 21, and expect to cut 2,000,000 feet. On both these limits they are cutting some fine timber, principally fir and spruce. These camps furnish employment for a large number of men in winter. Few of the settlers appear to take advantage of this opportunity to get employment, as nearly all the men are from outside points, and when the camps break up in the spring, they seek new fields of employment. I did not subdivide the northwest quarter of section 26, as this land is subject to flood and is at the present time largely covered with water, the only portion dry being a small fringe along the banks of Columbia river. I had considerable difficulty in surveying timber berth No. 543 on account of the river not being frozen very hard it being necessary for us to cross and recross it a number of times. This timber berth lies on the west side of Columbia river and consists of fractional southwest quarter of section 26, township 25, range 21. The berth is level, except at the southwest corner, where it rises to a height of about 300 feet. The soil is clay and sand, and will produce hay, grain, vegetables and fruit. There is an extensive strip of flat land on both sides of Columbia river, but owing to the river overflowing its banks, this land is covered with water the greater part of the year, and, therefore, not of much value even for grazing



purposes. To make this land available for settlement involves engineering difficulties, the solution of which is of the greatest importance to the settlers. Owing to the depth of snow on the benches and the stormy weather, I was unable to complete all of the work in townships 25 and 26, range 21, for which I had instructions.

Before discontinuing the work I ran the north and east boundaries of section 30, township 26, range 21.

The settlement in the Columbia river valley is confined to a narrow strip along the Kootenay road, so that between the settled lands and the mountains there is quite an extensive bench of agricultural land. These bench lands are from 100 to 1,000 feet above Columbia river and contain many small tracts of level land. The soil is clay, sand and gravel, with patches of rock, and the surface is covered with fir, spruce, poplar and birch. In most places the merchantable timber has been cut off, yet in many places there are quite large clumps of fir twelve to eighteen inches in diameter which were too scattered for lumbermen to log economically. There are numerous trails and roads through these lands, made by the lumbermen, and in some places the land could be cleared with little labour.

This part of British Columbia has many inducements to offer the settler. The summers are delightful, being warm in the daytime and cool at night, while the winters are mild. Good prices can be obtained for all kinds of farm produce. The soil is fertile, and there is plenty of timber for building purposes and fuel. An abundant supply of pure water suitable for all domestic purposes can be easily obtained. Roads are good, while schools and churches are within reach of all. Plenty of wild game is found in the forest and fish in the rivers and streams.

The weather for the greater part of the season was favourable for field work. We had two weeks of rainy weather in October, and some rainy and stormy weather in November and December.

I discontinued the work on December 15, and on the same day moved into Golden, paid the men off, and on December 19 arrived back in Brandon.



## APPENDIX No. 22.

## ABSTRACT OF THE REPORT OF W. A. DUCKER, D.L.S.

## SURVEY OF THE OUTLINES OF THE PORCUPINE FOREST RESERVE.

My first work was the survey of the east boundary of township 40, range 28, west of the principal meridian, starting from my base line of last winter. I then ran the east boundaries of townships 40 and 39, range 29, and having produced the east boundary of township 38, range 29, from the northeast corner of section 24 to the correction line, I ran the jog and fixed the corners on the correction line in accordance with the instructions of the Manual of Survey.

From this point I had to cut a road to Caverly's mills in township 38, range 28, a distance of about five miles, and from this mill there is a good winter trail to Bowsman from which point our supplies were secured.

I then ran the east boundaries of townships 40 and 39, range 30, from my base line of last year, running the jog and fixing the posts on the correction line in accordance with the instructions of the Manual. This latter meridian is the boundary between Manitoba and Saskatchewan.

I next ran the north side of the tenth correction line across ranges 30, 31 and fractional range 32 to the second meridian giving all quarter sections their theoretic width of forty chains and sixteen links.

At this time the snow was rapidly disappearing, and I took the party into Bowsman, which was reached on April 3, and to Winnipeg the following day, where the party was disbanded.

The general character of this forest reserve was pretty fully described in my report of last winter's operations. Most of the old timber was fire-killed some years ago and now lies in a tangle. The fires did not run through the swamps and the muskegs but nearly all the humus soil on the ridges was destroyed and most of the sandy clay sub-soil is pretty stony. The greater portion of the surface is covered with a thick growth of young timber, largely jackpine, though in the southern portion of the reserve there is more spruce and other timber which would be of value than in the central portion where I worked last year.

The snowfall of the past winter was exceptionally heavy, being thirty inches to three feet deep on the level, and with the windfall and undergrowth made any rapid progress impossible.

There are many fine lakes of considerable size throughout this reserve and in most of them the water is of a good quality and fish of various kinds are said to be plentiful. It is also a great summer range and breeding ground for moose, the barked trees on which they polish their horns being visible in all directions, but in winter time they move to the lower ground, and I think that only two were seen in the reserve by my party during the progress of the work.

The past two winters have been poor years for rabbits, and in consequence fur is very scarce and tracks of fur-bearing animals were very rarely seen.

There are some beaver in the reserve and a colony have a dam and a large house on section 6, township 39, range 30. A number of muskrat houses were also seen, though these animals are becoming very scarce owing to the high price of the fur for the past few years.

Owing to the large amount of fallen and decayed timber and the inflammable nature of the young growing conifers, great care will be necessary for several years to keep fire out of this reserve.

One fire crossed the south boundary last spring near Jackfish creek in range 32 at the time when the poplar were in bud, but apparently did not do much damage as it was a surface fire running in the dead leaves and grass; I do not think it ran far, but it killed the young poplar as far as it went.



## APPENDIX No. 23.

## REPORT OF CARL ENGLER, D.L.S.

MISCELLANEOUS SURVEYS IN NORTHERN ALBERTA.

OTTAWA, Jan. 24, 1911

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa.

SIR,—I have the honour to submit the following general report on the survey of the northern boundary of the Province of Alberta across Slave river.

On May 5, 1910, I left Ottawa arriving at Edmonton on May 10 where I was joined by my assistant Mr. J. A. Cote. We set out next morning for Athabaska Landing arriving there on May 13 in the evening.

The flotilla of scows employed by the Hudson's Bay company was to leave Athabaska Landing en route for the north on May 15, but owing to delays in procuring men to manage the scows and to a reluctance on the part of those in charge to leave when the water was low, the departure did not take place till the evening of May 21. We were finally compelled to start with fewer men than usual and in low water, conditions which delayed the progress of the expedition wherever rapids existed in the river. On account of the low water many spots were dangerous which under high water could be run with comparative safety, and owing to the scarcity of men it was necessary to tie up half the scows above such bad spots while the crew "doubled up" on the remaining boats, ran them down to where the river was safe and then came back for the rest.

These delays were slight however compared to those of portages. The first portage is at Grand rapids, the most formidable obstacle to navigation on the river, which was reached May 28 about noon. The river here is divided into two channels by an island. In going down stream boats usually land their cargoes at the upper end of this island, haul the cargoes to the lower end by means of hand-cars running on a rude tramway, run the boats down empty through the eastern channel (the smaller one) and reload them at the foot of the island. As the water was very low when we arrived it was necessary to run the boats for the last two or three miles above the rapids with half loads, each boat making two trips. It was not until the afternoon of June 3 that we were ready to embark below and proceed on our journey.

The river from Grand rapids to McMurray has many rapids. In fact to one inexperienced it seems to be all rapids. The total distance is said to be ninety miles, and I have been told that it can be run in high water in ten hours. When the water is low the "big cascades" necessitate the lightening of boats by making a short portage of about half their loads. On our trip this involved a delay of about a day. We arrived at McMurray on the evening of June 8.

Here we had another delay of about a week waiting for the steamer *Grahme*. The trip by the *Grahme* promised less delay, but when we got to Chipewyan we were compelled to wait three days for calmer weather, it being considered unsafe for the boat to go out in the lake when it was at all rough. After a further delay of about a day on Slave river in a vain attempt to right the Hudson's Bay company's stranded steamer *Primrose* we arrived at Smith landing June 22.

I have dwelt in detail on the time consumed in this trip (thirty-eight days from the time boats were to leave Athabaska Landing) so that another surveyor going into



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the country may know what to expect. The Hudson's Bay company are in the country primarily to trade in furs, their transportation business for the public being an incidental. They plan to make a certain number of trips in a season and insist rather on doing things with care and safety than on an exact time schedule. Consequently most of the other fur traders and others going into the country do so by getting a scow of their own and employing a skilled pilot and crew. I have been informed by men who have gone into the country in this manner that they have made the trip to McKay which is about thirty-five miles below McMurray in three days and to Fort Resolution in eight days. In the latter case a steamer was used below Fort Smith. While I do not doubt the exceptional character of these rates of travel there is no doubt that a great saving of time is effected.

Upon arriving at Smith landing I received a letter left for me by the Honourable Frank Oliver, Minister of the Interior, asking me to undertake the survey of the settlement should time permit. I therefore spent about two weeks at this work and then went to Fort Smith, a distance of sixteen miles, and began a series of zenith telescope observations to determine the latitude, after which an offset southerly to the boundary of Alberta (the sixtieth parallel) and an east and west line across Slave river completed the work. On either side of the river a monument was placed to mark the boundary.

Whenever possible during the progress of the work at Fort Smith hourly readings of the declination of the magnetic needle were taken. In addition to this at every stopping place on the trip from Athabaska Landing observations were taken for magnetic declination, dip and total force as well as observations for time with a view of obtaining approximate longitudes.

The return trip was begun August 2 when we crossed to Smith landing whence the steamer *Grahme* departed August 5, arriving at McMurray, August 9. The most difficult part of the trip from McMurray to Athabaska Landing took from August 12 to September 4. Six scows laden with furs of the Hudson's Bay company and other traders, the personal effects of the passengers, and food and cooking utensils for all, were hauled up stream against the swift current at a rate varying from four to twenty-five miles per day by a crew of about eight men to each boat. Portages were made at "big cascades" and at Grand rapids. Almost everyone who comes into the country goes out of it by this transport, at least so it seemed this season, as there were about sixty passengers. To anyone coming out independently I should think a large Peterborough canoe would have a great advantage it being so light that the trackers could make better progress.

A word as to the natural resources of the country may not be out of place. As regards timber, broadly speaking the whole river-valley is well wooded, all low river-flats and islands bearing good spruce for commercial purposes. At McMurray I measured a spruce ten feet four inches in circumference, and at many stopping places saw trees thirty inches in diameter. Many of the higher flats are covered with poplar of quite uniform size and as large as two feet in diameter. What lies outside of the river-valley I cannot say. Enormous cliffs of tar sand are seen from McMurray to McKay. The quantities of this sand are so great and some of it bears such a large proportion of tar that one would naturally expect to find pure tar or coal, gas, or oil in the vicinity. While several borings have been made for oil none are deep enough to be conclusive in their evidence. At Grand rapids a seam of coal shale was burning when we passed, and at Pelican river from a boring originally made for oil a gas flame from fifteen to twenty-five feet high shot up, the force of the natural gas making a noise like the roar of a waterfall, which could be heard several miles.

As to the agricultural possibilities of the country I should speak with caution as I was there in the warm season only. I was surprised at the rapidity and perfection of the growth of the garden produce, such as potatoes, radishes, lettuce, carrots and onions. At Fort Smith on the last day of July oats were headed out with a slight



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suggestion of the yellow of ripening, and barley was almost ripe; in fact the barley was so far advanced that if cut it would probably ripen in the shock. Potatoes were out in bloom. Unless this season is an exceptional one, I should say that it would be possible with a good market to carry on mixed farming, though I do not consider it advisable to attempt it while land with better climatic conditions is available. At Calling river on September 2 I saw a small field of wheat which was well ripened and as nearly as I could tell had not been damaged by frost. The owner said he had grown wheat successfully for several years. This is the farthest north that I saw wheat growing.

I have the honour to be, Sir,

Your obedient servant,

CARL ENGLER, D.L.S.



**APPENDIX No. 24.****ABSTRACT OF THE REPORT OF L. E. FONTAINE, D.L.S.****MISCELLANEOUS SURVEYS AND INSPECTION OF SURVEYS MADE UNDER CONTRACT IN THE  
EDMONTON DISTRICT.**

On February 7, 1910, I reached Ottawa and having received my final instructions I left after a day's delay for Saskatoon to inspect the new stock of iron posts supplied to the Department to be used by surveyors in marking section and quarter section corners.

I then proceeded to Edmonton, where I arrived on February 17. Having completed my organization I left on March 1 for Entwistle to perform some miscellaneous surveys in township 55, range 7 and township 54, range 8, west of the fifth meridian.

Having completed this work on April 20, we proceeded westerly and from Chip lake as a base inspected the surveys performed under contract No. 10 of 1909, and made a retracement of part of township 54, range 12, west of the fifth meridian.

On May 26, I returned to Entwistle, and for the remainder of the season was engaged upon the following surveys in the order named: the examination of the addition to contract No. 18 of 1908, contract No. 25 of 1908, contracts Nos. 16, 23, 9, 22 and 25 of 1909, the reexamination of contract No. 12 of 1908 and some check measurements and necessary traverses in this last contract.

The principal drawbacks of the season were the poor roads in some localities and the absence of fords on the streams. However, the country is rapidly becoming accessible on account of the extensive railway construction being carried on and settlement is progressing satisfactorily.

Separate reports have been submitted on the condition of the surveys in each contract inspected.



## APPENDIX No. 25.

## ABSTRACT OF THE REPORT OF J. FRANCIS, D.L.S.

## SURVEYS IN SOUTHWESTERN ALBERTA.

I left Edmonton on May 10 and reached "The Leavings" on McLeod river on the 14th. I remained there till the 20th, as I was compelled to send back to "big eddy" for supplies, feed for the horses being very scarce. I reached township 48, range 24, west of the fifth meridian on May 27.

On section 31 of this township the west fork of the McLeod divides into two streams of about equal volume, both coming from the rocky hills, one from the south, and the other from the southwest.

Both branches were explored for the surveyed coal claims which were found on the south fork about five miles from the confluence. No coal, however, was seen on the surface in this district. The valleys contain some timber fit for ties and sawlogs. The hills have been burnt over, but are now reforesting with pine and spruce. On June 15 we proceeded to our next work which was situated in the west half of township 49, range 23. This tract is traversed from north to south by McLeod river, the valley of which with its slopes contains some fairly large timber, consisting of pine and spruce, fit for sawlogs and railroad ties. One seam of coal was noticed on the northwest quarter of section 17, and a claim to this had been roughly marked on the ground.

Our next move was to townships 45, ranges 20 and 21. We went by a pack-trail made by A. H. Hawkins, D.L.S., up McLeod river, over some burnt hills, crossing the head waters of the Pembina and down a branch of Southesk river.

Our work in this district was crossed from east to west by Southesk river, which receives several tributaries, mostly from the south side. A range of high hills, rising about 1,400 feet above the river, commences in section 10, township 45, range 21, and extends northwesterly through this township and into the next range. The south slope of this range of hills is covered with a thick growth of pine and spruce, generally small, but having trees large enough to furnish a considerable number of railroad ties. The north slope is not so well timbered, having more spruce and balsam than pine. On sections 13 and 14, there are some open places, being mostly hillside muskegs, wet and of no use agriculturally. Numerous prospects or coal exposures were noticed along the banks of Southesk river. These coal seams were not thick, being generally in an almost vertical position, and were apparently broken from the parent bed. Development work would be required to ascertain if these seams contained sufficient quantities of coal to warrant the expense of roads. The valley of the Southesk through range 21 is only from five to ten chains wide, with successive benches extending on each side, finally merging into the high hilltops. The current of the river is swift and there are many rapids. The river is about sixty feet wide with a normal depth of eighteen inches, and in some places passes through canyons where water-power could be easily developed. During the months of August and September several snowstorms were encountered in this district, which I think is something unusual for this region.

We ran short of provisions after surveying twelve miles in township 44, range 21, as it had now become difficult to get them brought in on account of bad trails, and on October 2 we left this district for Prairie Creek, where we arrived on October 6. I procured supplies enough from the railroad contractors and roadside stores to survey part of township 50, range 25. This portion consists of burnt hills and intervening



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valleys, both having a general slope northwesterly to the valley of Prairie creek. The forest fires which have passed over this part seem to have rendered the soil almost useless even for the production of grass or the speedy reforestation of the surface. On Cold creek, a tributary of Prairie creek, coal was observed, claims having been already surveyed. The different tracts surveyed this year are of very little use for agricultural purposes, the altitude being too great to mature any grain crops. Vegetables, however, could no doubt be grown in many of the valleys. As these tracts were all more or less timbered, having few open places, there was no hay, and very little pasture. No part could be recommended for ranching or settlement. The timber growing on these lands will furnish ties, culvert and bridge timber for railroads into the coal fields, and an inexhaustible supply of mining props for the mines. With the exception of township 50, range 25, the country surveyed, wherever overrun by fire in the past, is now covered with a thick growth of young pine growing up through the underlying windfall. This should be preserved as far as possible so as to insure rainfall and moisture.

On finishing our work at Prairie Creek on October 26, we started on our return journey to Edmonton, where we arrived on November 1.



## APPENDIX No. 26.

## ABSTRACT OF THE REPORT OF A. H. HAWKINS, D.L.S.

## SURVEY OF PART OF THE TWENTY-FIRST BASE LINE, WEST OF THE FIFTH MERIDIAN AND MISCELLANEOUS SURVEYS IN ALBERTA AND SASKATCHEWAN.

After a few days spent in organizing the party, I left Edmonton in March and proceeded by way of Athabaska Landing and the north shores of Athabaska and Little Slave rivers and Lesser Slave lake to Grouard, and thence by wagon road to our starting-point, the northeast corner of township 80, range 19. The best way to enter this country, however, is to wait until navigation opens and then Grouard may be reached by boat from Athabaska Landing. From Grouard fairly good roads lead west and north through the best districts. Along the road followed from Grouard to the base line, squatters or homesteaders are settled on almost every patch of open land. The tilled fields, haystacks, cattle, horses, chickens and hogs all in good condition, bear evidence of the productiveness of the land in this district.

The production of the base line eastward was commenced on April 25 and completed to the fifth meridian by the end of August; only two or three days were lost on account of rain throughout the season.

The alluvial soil throughout the district is a clay or sandy loam with a subsoil varying from clay to sand and gravel and appears very fertile. At Whitefish Lake and Wabiskaw there are excellent gardens, and the whole district is covered with a rank growth of grass and underbrush. The timber is light and can be cleared away with little difficulty.

The surface is timbered with poplar, spruce, balm of Gilead and balsam on the ridges and with spruce, tamarack, balm of Gilead and black alder in the low lands. The timber has no commercial value, but will supply the needs of settlers for many years for buildings, fences and fuel.

It is reported that a bush of spruce timber, about five miles by four, exists about six miles north of the line. The timber here is said to be from six to thirty inches in diameter tall and clean.

From range 19 to range 9 about sixty per cent of the land is fit for agricultural purposes, east of range 9, where it is more level and where swamps and muskegs occur between forty and fifty per cent is fit for settlement. However, a large proportion of the muskegs and marshes can be easily drained.

Hay is abundant throughout the district. It is difficult to specify the hay lands where they are so numerous, but particular mention might be made of Atekamic river along whose banks thousands of tons of hay could be put up from the excellent tracts between the base line and Atekamic lake. The same is true of the lands along Pastecho river and Atekamic lake, and a large marshy lake in sections 31 and 32, township 80, range 16.

Fresh water is abundant: the North and South Heart rivers with their tributaries supply ranges 18 and 12; Atekamic lake and river supply ranges 12 to 8, while ranges east of this are supplied by Nepesekopon and Pastecho rivers. Serious flooding is not likely to occur along any of these streams except perhaps Pastecho river whose valley is very wide.

Numerous rapids are reported to exist seven or eight miles down Atekamic river from which it may be possible to develop power.



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The climate is about the same as that of Edmonton. The nights are cool and summer frosts are frequent, but usually so light that vegetation is not injured. No doubt with the advance of settlement these frosts will no longer occur. During the spring and summer months there are long hours of sunshine, and vegetation matures rapidly. The snowfall is moderate and rain is not excessive.

No lignite nor coal was noticed, but petroleum is reported to have been found on Pelican river to the east and on Loon river to the north.

Moose and caribou are said to be numerous; bears are plentiful and water-fowl of all kinds are to be seen on the lakes, open marshes and rivers. Spruce and willow-partridges, and fool-hens are numerous. A few rabbits were noticed. Lynx, foxes and wolves were very scarce, but muskrats were plentiful. The beaver, apparently, is extinct, though signs of its past activity, such as old cuttings and dams are to be seen on every hand; not once during the season did we see a fresh indication of the animal's work. Pike and jackfish are to be found in the large streams, and these, with the abundance of whitefish in the lakes, provide food for the Indians and their dogs.

Two settlements were passed during the trip, viz: Whitefish Lake and Wabiskaw. Whitefish Lake settlement is situated on the east shore of Atekamisis lake. Here are trading posts of Messrs. Revillon Bros. and the Hudson's Bay company, and an Anglican mission school and church. A very fair wagon road leads to Grouard which can be reached in two days.

Wabiskaw is situated on the southerly end of the most northerly of the Wabiskaw lakes. Here also are stores and trading posts of Messrs. Revillon Bros. and the Hudson's Bay company and an Anglican mission school and church. Three or four miles south is a Roman Catholic mission school and church. Wabiskaw is in a rather isolated location; in summer it is most easily reached by water from Pelican rapids on the Athabaska, but there are several portages. In winter a sleigh trail leads across the Pelican mountains from a point on the Athabaska about forty miles northwest of Athabaska Landing.

Upon our return to Edmonton, I reengaged the party, and in a few days proceeded to township 52, range 1, west of the fifth meridian to traverse a lake in section 30. There are several fine sandy beaches around the lake, and the land on the south-east has been subdivided into lots. It is a very beautiful place for a summer resort.

For the remainder of the season we were occupied on the following miscellaneous surveys: traverses in township 47, range 1, west of fifth meridian, township 53, range 25 and township 58, range 11, west of the fourth meridian; investigation of survey monuments in township 48, range 22, and in township 45, range 4, west of the fourth meridian, and in township 53, range 25, west of the third meridian; retrace-ment in township 51, range 27, west of the fourth meridian, and in townships 29, ranges 31 and 32, west of the principal meridian.



## APPENDIX No. 27.

## ABSTRACT OF THE REPORT OF E. W. HUBBELL, D.L.S.

## RESURVEYS AND INSPECTION OF CONTRACTS IN MANITOBA AND SASKATCHEWAN.

My first work was traversing a small lake in township 42, range 10, west of the second meridian. From there we cut a trail to township 42, range 9, and began the inspection of contract No. 13 of 1909, completing this work on April 28.

The soil throughout this contract is in general black loam with clay subsoil, suitable for the production of wheat, oats and vegetables. The surface is level and is covered with willow and second-growth poplar, with considerable windfall, but we did not notice any tracts of large timber. There are numerous muskegs and swamps interspersed throughout these townships in which plenty of good water is found; there are also a number of fine creeks. Red Deer river flows easterly across the northern part of township 48, range 7, and a wagon trail has been cut out to this river for nine miles by the lumbermen at Prairie River. We did not perceive any indications of lignite, coal or minerals.

Game is apparently not plentiful as we saw only a few moose. The Canadian Northern railway is about eight miles to the north and situated thereon is Prairie River, a small lumbering village and the nearest express and post-office.

Along our trail from Nut lake to these townships, there are numerous open spaces which seemed to me very desirable for homesteading, every requirement of the settler being obtainable.

From there we proceeded to contract No. 17 of 1909, which comprises townships 44, ranges 2, 3, 4 and 5 and a portion of township 43, range 5, west of the second meridian. We had to cut a trail nearly all the way, but took advantage of the open muskegs which on May 3 were still frozen sufficiently strong to carry wagons. We passed through level country, rolling in places, and thickly covered with poplar and spruce varying in size from six to forty inches in diameter, with willow, hazel, alder, dense underbrush and immense tracts of large windfall. A great portion of this timber is well adapted for lumbering purposes, but until this has been cut the country is of little value for settlement. The soil throughout the townships of this contract is in general sandy clay and black loam with clay subsoil. A large portion would be suitable for the production of wheat, barley, oats, flax and vegetables. There are many small swamps and muskegs interspersed, from which there is always an ample supply of fairly good water.

In addition to Red Deer river, averaging about three chains in width which passes through several of these townships, there are many fine creeks, besides Eto-mami river, which is nearly as large as the Red Deer. Both these rivers are utilized by the various lumbering industries in this district to convey millions of logs to their sawmills, situated along the Canadian Northern railway. We saw no indications of coal, lignite veins or minerals. Owing to the low water the sawmills had to discontinue work early in the spring, an unusual occurrence for this section of the country. On May 9 we moved into Greenbush, a small lumbering town on the Canadian Northern railway.

There are no trails in this vicinity owing to the continuous muskegs along the railway track, and on this account we had to move our outfit thirteen miles by rail from Greenbush to Hudson Bay Junction, a small town of about 200 inhabitants. From there we went to further inspect contract No. 17, completing this work on May



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19. We then moved into township 45, range 3, a portion of contract No. 4 of 1910, which we examined.

This township is thickly covered with poplar, spruce, tamarack and willow, with many muskegs interspersed. A branch line of the Canadian Northern railway passes through this township, starting from Hudson Bay Junction and terminating at The Pas, about ninety miles distant. All the material for the construction of an immense iron railway bridge across Saskatchewan river at The Pas is freighted on this line.

On May 23 we moved to Tisdale, where we arrived the following day. We traversed a lake in township 42, range 13, upon completion of which we went by trail to Kinistino, a distance of about one hundred miles. I have already reported on this part of the country. However, I may add that settlement seems on the increase in every direction in this very fertile section, which I have previously termed 'The Garden of the Prince Albert district.' On June 2 we moved into township 48, range 21, west of the second meridian and commenced the resurvey of this township the following day.

Access to this township is easily obtained by various routes. A surveyed trail passes through it from Prince Albert to Fort a la Corne, and there is also a fine graded road to Kinistino, a thriving little town on the Canadian Northern railway, about fifteen miles distant. The soil of the southern two-thirds of this township in general is black loam with clay subsoil, while the northern third is sandy and practically unfit for cultivation, although all kinds of grain and vegetables are produced in the southern portion.

The surface throughout is rolling, about sixty per cent being covered with poplar, tamarack, jackpine, willow and various clumps of spruce.

In the northern part of the township considerable jackpine and some spruce is available for manufacturing purposes. There are numerous hay marshes scattered throughout, which supply sufficient good hay for the settlers in this vicinity. Good fresh water is found in Saskatchewan river, in fairly large lakes in sections 1 and 19, and in many smaller lakes and ponds. The water in these lakes is permanent, and the land is not subject to flooding. We were informed by the settlers that the climate is most desirable, there being no summer frosts of any account. Great quantities of jackpine and poplar furnish unlimited fire-wood. We did not notice any indications of coal, lignite veins, stone for quarrying, or minerals.

There are a few moose and jumping deer in this vicinity. Ducks are numerous and a few prairie-chickens and partridges were seen. All the agricultural land in this township is settled on. This section of the country is ideal for mixed farming, and as such is taken advantage of. In connection with our work we traversed several lakes and a portion of Saskatchewan river, connecting our lines, when possible, with monuments on surveyed trails.

Our next work was the resurvey of township 49, range 27, west of the second meridian, which is north of the Saskatchewan and about six miles northwest of the city of Prince Albert. We commenced the work of subdivision July 6 and finished August 9.

This township is very easy of access, there being two well-travelled surveyed trails passing through it. The one about the centre runs to Shellbrook, Mont Nebo, and thence to Green Lake. The other trail farther north leads to Sturgeon lake. About seventy-five per cent of the soil of this township is very light and sandy and is unfit for agricultural purposes, but at the south and north there is about one and one-half tiers of sections in which the soil is principally black loam of varying thickness. Nearly all, if not all, the sections suitable for homesteading are filed on. There is no scarcity of water, as Saskatchewan river flows through the south part and Shell river, about a chain wide, meanders diagonally across the township entering the Saskatchewan in section 3. In the northeast corner there are numerous sloughs and muskegs containing very good water, the supply being permanent.



The Prince Albert Lumber company send a large number of logs from Sturgeon lake district down Shell river, thence down the Saskatchewan to their mill at Prince Albert. In the spring Shell river is from eight to twelve feet in depth with a current of four miles per hour, and, while there are no natural falls or rapids where power might be developed, still, with some outlay, a dam might be constructed which would develop the necessary head of water for power, as the banks are high in places and comparatively close together.

Indian Reserve No. 94A consists of sections 32, 33, 34 and 35 of this township. The Canadian Northern railway, which has been extended from Prince Albert through Shellbrook, passes through this township and crosses Shell river on a high wooden trestle bridge. The extension of this line is invaluable to the settlers between Prince Albert and Battleford and opens a vast tract of excellent country for settlement.

Our next work necessitated a journey of 150 miles by trail to the Lost River country, where we arrived on August 18. During this trip we passed through some beautiful fertile country via Fort a la Corne, an old Hudson's Bay trading post. There are but few settlers along this route, a considerable portion of the country not being well adapted for settlement. However, in the Lost River country a great change has taken place in the past year; houses have sprung up in every direction and a fair quantity of land is under cultivation. This is an ideal country for mixed farming, there being plenty of hay, pea-vine, water, fuel in abundance, rich black loam and timber of all dimensions. One of the finest gardens I have ever seen in the west I saw here in township 50, range 14. The cabbages, cauliflowers, carrots, potatoes, cucumbers, tomatoes and corn were exceptionally large and fine. The climate is all that could be desired and game of all varieties is plentiful, particularly moose. The country is easy of access by good trails. Several new post-offices have been opened during the past year, and the nearest railway towns, Star City and Tisdale, on the Canadian Northern railway, are about fifty miles distant.

After completing our work here we left for Sprague, Manitoba, 550 miles distant, where we arrived on August 28. We commenced our work of inspection in township 1, range 15, east of the principal meridian, a part of contract No. 32 of 1907, after which we inspected contract No. 19 of 1909.

Nearly the whole country, with the exception of occasional sand ridges, is either a tamarack swamp, bog, or open floating muskeg, over which no horse could possibly travel, and at certain periods of the year not even a man could cross them. The surface of these muskegs consists of tangled matted grass and moss held together by fibrous roots, while underneath is muck, water and quicksand, varying in depth from two to ten feet.

The greater part of this district is swamp and muskeg, only a small percentage of which can ever be reclaimed by drainage, there being little difference between its altitude and that of Lake of the Woods. There are very few settlers and little land suitable for agricultural purposes, except about two hundred or three hundred acres around Moose lake. This lake, which teems with jackfish, is a fine body of clear water about three miles long and a mile and a half wide, and is surrounded by high banks covered with poplar, birch, spruce, cedar and willow. There are no trails except the Dawson road, which passes through the centre of these contracts from St. Anne to the Northwest Angle and is impassable during the greater part of the year. The soil in these townships, except along Reed river, around Moose lake and on a few ridges that are scattered throughout, is generally moss and vegetable muck. The surface might be classed as level and except on the open muskegs is covered with spruce, tamarack, cedar, ash, oak, poplar, willow and some jackpine, with a little birch along the watercourses and borders of lakes. The timber is of fair dimensions, varying from three to twenty inches in diameter, and is suitable for lumbering purposes, railway ties and fencing. The water is fresh and the supply adequate. Lake of the Woods, Whitemouth lake, Moose lake and Reed river receive a large supply of water from the



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extensive marshes and muskegs in the vicinity. Except for a few miles along the banks of Reed river, very little hay is to be had. This river rises in township 2, range 15, and flows northeasterly into Lake of the Woods. It varies in depth from one to ten feet, and its average width is about one chain, although it is much wider towards its mouth. Fire-wood in large quantities is easily obtained, and lumbering is carried on extensively by the Sprague Lumber company who own limits in this district and ship by rail to Winnipeg. Moose, bears and porcupines are numerous, while partridges and prairie-chickens are very plentiful. The Canadian Northern railway has a branch from its main line about ten miles east of Sprague, which extends a mile into township 1, range 16. Sprague is the nearest express, telegraph and post-office, also the last railway station on the Canadian side.

Our next work was the inspection of contract No. 5, of 1910, comprising townships in the vicinity of Mont Nebo and Indian reserves Nos. 104 and 118, west of the second meridian, about seventy-five miles northwest of Prince Albert. We entered this contract from the south by a good trail which is surveyed from Prince Albert to Green Lake, passing through Shellbrook and Mont Nebo, the former being the nearest telegraph and express office to this work. There are numerous trails in this vicinity radiating in every direction, this being a flourishing lumber district and comparatively well settled.

The soil in general throughout the townships comprising this contract is alluvial black loam varying from six to ten inches in depth, with clay and sandy subsoil, suitable for the production of wheat, oats, vegetables, etc. The surface in general is rolling, mostly covered with tamarack, jackpine, poplar, willow and considerable spruce of fair dimensions, well adapted for lumbering purposes. There are large patches of "park land" with small scattered bluffs of poplar and willow making ideal homesteading. Township 53, range 7 is mostly covered with poplar three to nine inches in diameter interspersed with a network of lakes and marshes. Hay is not very plentiful in this vicinity, but great quantities can be easily obtained from the swamps and marshes to the west. Shell river meanders through several of these townships, and at the time of inspection was from two to four feet deep. The volume of water is not sufficient for the development of power. The climate is agreeable and not subject to sudden changes of temperature. Great quantities of fire-wood can be readily obtained in these townships. We observed no indications of coal, lignite veins, minerals, nor stone in sufficient quantities for quarrying. Moose, elk and jumping deer are frequently seen, while prairie-chickens, partridges and ducks are very plentiful.

The Canadian Northern railway has a branch line from Shellbrook which passes through the eastern portion of this contract to Ladder lake, where the Big River lumber camp is situated on Cowan lake.

We finished the inspection of this contract on November 7 and moved camp to Witchehan lake, a large sheet of water in townships 51 and 52, range 11, west of the third meridian, and commenced the inspection of contract No. 6 of 1910, comprising townships 50 and 51, ranges 12 and 13, west of the third meridian, finishing it on November 17.

These townships are pretty heavily wooded with poplar, willow, some spruce and jackpine and contain numerous small lakes of fresh water. A trail crosses Big river in township 53, range 11, passes through this contract and joins the main trail from Battleford at Glenbush post-office in township 49, range 14. There are no settlers, although there are some excellent quarter sections admirably adapted for settlement. The surface is rolling and the soil sandy loam. From here we moved into township 53, range 15, a portion of contract No. 7 of 1910, and commenced the inspection of this work, finishing it on November 28. The townships comprising this contract are thickly covered with poplar, willow, spruce, tamarack and heavy windfall. The soil is black loam and sand, and the surface is generally rolling. These townships are



too heavily wooded for settlement, there being but little, if any, open country. Long lake in townships 52 and 53, range 15, is a beautiful sheet of fresh water about ten miles long and from three-quarters to one mile in width, with sandy shores and good banks surrounded at the southern end by marshes of very good hay. Great quantities of fire-wood can be readily obtained in these townships. Moose, jumping deer, bears and timber-wolves were seen occasionally, and also great numbers of partridges. The nearest post-office is Glenbush, thirty to forty miles distant, while Battleford is the nearest railway station and telegraph office. There are no settlers in these townships.

After completing our work here we moved to Prince Albert, where we arrived on December 8, and from there went to Prairie River to inspect the remainder of contract No. 4 of 1910. The snow now was twenty-two inches deep on the level and the weather exceedingly cold. We examined townships 44, ranges 7, 8, 9 and 10, west of the second meridian. These townships are heavily wooded with large poplar, spruce, tamarack, willow and windfall, a large portion of which is suitable for lumbering purposes. There are no settlers; in fact the country is not well adapted for settlement, there being too much timber and muskeg. The surface is level and the soil black loam with clay subsoil. There is a trail used by lumbermen from Prairie River to Red Deer river, a distance of nine miles, and there are also several pack-trails.

From Prairie River we moved our outfit by train to Mistatim and finished the inspection of these townships on December 21, this being the last work of the season.

In general terms the weather conditions for the production of crops in northern Saskatchewan were very good, a splendid yield being the result, but in southern Saskatchewan lack of rain in a measure prevented the usual bountiful harvest. The season on the whole was excellent for surveying operations, as there had not been for many years so light a snowfall as the previous winter and so small an amount of rain during the summer. Lakes, swamps and creeks which heretofore had been overflowing were comparatively dry. This was especially noticeable in the muskegs of the south-east portion of Manitoba. In the early spring lumbering operations had to shut down considerably earlier than usual on account of the scarcity of water in the rivers which were left filled with logs beached high and dry. Consequently many of the mills closed and men were thrown out of employment earlier than usual.

Moose, elk, bears, porcupines, timber-wolves, coyotes, beaver, skunks, mink, rats and rabbits were quite numerous in different localities. Prairie-chickens, partridges and ducks were very plentiful.

In many of the larger lakes and streams jackfish abound, also some sucker, whitefish, gold-eye and pickerel, especially in Greenwater, Moose, Long and Birch lakes and Red Deer river.

There are some excellent large ranges for horses and cattle along the valley of Big river (northwest of Mont Nebo), also around Witchikan, Birch and Meadow lakes. A good trail has been made recently from Battleford to Meadow lake which is about one hundred miles north of Battleford. Several ranchers have already taken advantage of the opportunities afforded them by these splendid ranching sections and have located there with numerous bands of horses and herds of cattle.

A very marked increase of settlement is noticeable throughout great tracts of country, which a year ago had but few, if any, settlers. Houses have sprung up in every direction. Post-offices have been established, schools built and roads and trails improved, while a fair proportion of land has been put under cultivation.



## APPENDIX No. 28.

## REPORT OF F. H. KITTO, D.L.S.

## SURVEY AT ST. ALBERT SETTLEMENT, ALBERTA.

OTTAWA, October 24, 1910.

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa.

SIR,—I have the honour to submit the following report on miscellaneous surveys performed in and near St. Albert settlement, Alberta, during the past season.

My work consisted of rerunning certain boundary lines in St. Albert settlement adjacent to Big lake and in townships 53, ranges 25 and 26, west of the fourth meridian, and in traversing part of Atim creek, in order to secure additional information required in issuing new plans of St. Albert settlement and adjacent townships.

I left Ottawa on August 13, and reaching Edmonton I hired a light team and buckboard and prepared to leave for the field in the morning. I began on some scattered work in open country with one man to assist me, securing farm help for digging pits when needed. After completing the most scattered parts of the work I dispensed with the horses. I secured accommodation for myself and men at a farm house on lot E., St. Albert settlement, later moving to the Astoria hotel, St. Albert, and again to the Acme Brick company's boarding house three miles south in order to keep close to my work as it progressed. Transport was secured locally for moving our baggage from place to place, and this method was found both an economical and convenient substitute for a regular camp.

After completing the work in open country thick second-growth bush was encountered. I then sent to Edmonton for additional help, and had no trouble in getting more men. The work was done with all despatch, though the weather during this time happened to be very bad, being the usual summer break-up.

On lot E of the settlement was a market garden producing a most abundant crop of all our common vegetables. Harvesting was under way in the district and all crops were exceptionally good. On the large marsh about Big lake hay was being cut and would yield about three tons to the acre. Apparently this marsh and much of Big lake could be easily drained by dredging Sturgeon river below the village, thus opening up many sections of valuable land. First-class brick is being made in section 21 of township 53, range 25, by the Acme Brick company of Edmonton. Much of the land in the township appears to be held for speculation and is covered by second-growth woods.

I completed my work on September 2, and on the following day returned to Edmonton and disbanded the party. I left for home on September 5, reaching Ottawa on the 9th.

I have the honour to be, Sir,  
Your obedient servant,  
F. H. KITTO, D.L.S.



## APPENDIX No. 29.

## ABSTRACT OF THE REPORT OF J. L. LANG, D.L.S.

## - SURVEYS IN SOUTHWESTERN ALBERTA.

Leaving Cowley on June 13, I reached my first work in townships 7 and 8, range 5, west of the fifth meridian on the 16th, and was engaged there until the middle of July. About that time fires broke out, due to the excessive drought, and the whole party was engaged in fighting them for about three weeks.

On August 11, I moved to township 6 and 7, range 4. These townships are very rough and packhorses had to be used for all the work done there. ..

On October 5, I proceeded to township 5, range 4, where I worked till November 12. The frequent snowfalls then made work impossible, and I was forced to move out of the mountains.

During the remainder of the season, until December 12, I was engaged on re-tracement work in townships 6 and 7, range 3, and townships 5 and 8, range 1. I also made a traverse of part of Oldman river in township 8, range 1.

The outstanding feature of the district in which I was working is the coal deposits. These seem to be widespread and of very great value. The principal companies are the International Coal and Coke company of Coleman and the West Canadian collieries of Blairmore. In addition to these there are several smaller companies, largely in a development stage, operating along the Crowsnest branch, and also a number of prospects usually some distance from the railroad.

In the valley of the Southfork there are three properties being developed which have, apparently, great possibilities, together with numerous prospects of which little can be said save that they seem promising. Until a railroad is built up this valley these properties cannot of course be put on a shipping basis. A line has already been located, however, and it is understood that the road will be built shortly. In section 34, township 5, range 4, lie the remains of an oil company floated a year or two ago. Absolutely no prospecting work had been done; the machinery is lying on the ground as it was brought in, and there is no trace of oil to be found in the vicinity. The resting place of the machinery is known locally as 'The Oil Wells.'

After the coal deposits, the principal natural resource of the district is the timber, and this has been sadly depleted by fires. The southern part of township 8, range 5, was burnt over some years ago; the northern part contains some very good timber, mainly spruce and jackpine, and lumbermen have been and are operating there. Part of this, however, was burnt this summer. Township 7, range 5, contains some good timber, but is also being cut over. Township 7, range 4, was almost entirely burnt over some years ago, but there is still some good timber along its western boundary. Township 6, range 4, is very well timbered with large spruce, jackpine and scattered fir. The country south and southeast of this township appears also to be well wooded and to be yet untouched by fire or lumbermen.



## APPENDIX No. 30.

## ABSTRACT OF THE REPORT OF A. LIGHTHALL, D.L.S.

## SURVEYS IN THE NEW WESTMINSTER DISTRICT IN THE RAILWAY BELT OF BRITISH COLUMBIA.

About April 16, 1910, I engaged my party at Vancouver and proceeded to lay out a piece of agricultural land cut off from timber berth No. 510 in township 6, range 7, west of the seventh meridian. This is situated at the head of the north arm of Burrard inlet and was reached by steamer from Vancouver. It is a flat alluvial strip of land in a narrow valley on the east of Mesliloet river. It will make a good piece of fertile land when the stumps and underbrush are removed.

On May 2 we moved camp to township 39, west of the coast meridian, to survey timber berth No. 535, comprising all of section 28. We reached that place by taking steamer to the British Columbia electric power plant on Burrard inlet and crossing to Buntzen lake. The berth lies on the side and top of a mountain about two thousand feet high, on the east shore of this lake. The land is too high and rough to be suitable for agricultural purposes, but a strip at the southerly end of the lake is being logged by the Patterson Lumber company.

We next proceeded to Dewdney by rail and thence by wagon to Hatzic prairie, a strip of low wet land in a valley about a mile wide and extending north and south between Fraser river and Stave lake. We first ran some section lines on the east side of the valley in township 21, east of the coast meridian. The land here is heavily wooded and lies on a fairly steep hillside. A few settlers have taken up farms. The land in the bottom of the valley is good where not too wet, and the many settlers seem to be doing fairly well in dairying and fruit-growing.

We then subdivided about three thousand acres on the west side of the valley in sections 10, 16, 21, 28, 27 and 34. Here there is an extensive tract of bench land heavily wooded with second-growth fir, hemlock and cedar. Quite a number of settlers are located here, but have done little up to the present. When the land is cleared it will be valuable for fruit growing and dairying, the soil being a sandy loam with a gravelly subsoil. When a new road is opened up the district will develop rapidly. Beaver are plentiful, their dams being found on all the small streams. Bears and deer were also seen. No minerals were found.

The survey was continued north into township 4, range 3, west of the seventh meridian. The land here, which is lower and slopes towards Stave lake, is well settled, but much of it will be flooded when the power plant now under construction on this lake is completed. The occupations of the settlers are mixed farming and lumbering on a small scale.

Our next work was in township 40, east of the coast meridian, where we surveyed timber berth No. 537. The land in this township south of Pitt river is known as 'Pitt meadows.' It is low and flat and covered with hay and small brush. It will have to be dyked and well underdrained before it can be successfully farmed. This has been done on a great part of it and it is now an important dairying and stock-raising centre. The land to the north is rough and rocky and nearly all that is suitable for agriculture has been homesteaded or taken up as timber berths. A stone-quarry is in operation in section 22; the stone is shipped to New Westminster.

We then moved to the head of Pitt lake and surveyed timber berth No. 537, on Scott creek, a swift-flowing stream, about thirty feet wide and two feet deep, emptying into Pitt lake from the east, about a mile from the head of the lake. The timber



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here is about the best I have seen, fir, cedar and hemlock growing to enormous sizes. The timber can be easily taken out as the land all slopes to Scott creek. Considerable water-power could be developed on this creek. About fifty or seventy-five acres of land will be available for agriculture when the timber has been removed.

Our last work was in township 41, east of the coast meridian. This township is fractional and consists of four sections in the valley of Silver creek. The land is mostly low, flat prairie, flooded at high water. By dyking and draining it can be made into good dairying or grain-growing land.

The party disbanded at Westminster Junction on November 22.



## APPENDIX No. 31.

## REPORT OF G. J. LONERGAN, D.L.S.

## INSPECTION SURVEYS IN ALBERTA.

BUCKINGHAM, QUEBEC, February 18, 1911.

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa.

SIR,—I have the honour to submit the following report on inspection and miscellaneous surveys carried on in the Edmonton district last season.

I left Ottawa on April 20 for Edmonton and arrived there on the 25th. After spending a few days organizing my party and purchasing supplies, I started for Clover Bar to make a restoration survey of the east boundary of sections 18 and 19, township 53, range 23, west of the fourth meridian. After a little difficulty this matter was settled to the satisfaction of all parties. Clover Bar in the winter time may be reached by a short route from Edmonton, but in the summer the only way is by Strathcona, this making a somewhat lengthy way for the farmers to haul their produce to market, which could be avoided by placing a ferry at or near the Grand Trunk Pacific railway bridge; in connection with this matter I might say that it is regrettable that the government did not come to some terms with the railway company so that a traffic and railway bridge could have been built in one, as has been done at Fort Saskatchewan. I would like to mention that Clover Bar is one of the most fertile sections of Alberta. It would require but a short drive through the country to satisfy the most skeptical that farming in this part is as profitable an occupation as a man could apply himself to.

After completing the work at Clover Bar I moved to township 53, range 28, for restoration surveys required in that township; I travelled on the graded roads from Edmonton to St. Albert, thence in a westerly direction along the north shore of Sturgeon river and around Big lake, crossing the Michael Calahoo Indian reserve. This country is very rolling and covered with poplar from four to ten inches, and a thick growth of scrub; the soil in most places is clay, or clay and gravel mixed. Although this township is not more than thirty miles west of Edmonton, the land has but recently been taken up, and it is not yet safe to speculate on the success of the settlers. However, judging from the way they have started hog-raising, they appear to be a people up to the times, and are looking after their share of easily-earned money.

My next work after completing the survey in this township was in township 53, range 3. To get there I went almost straight east, passing through the Beaver hills, a rolling and timbered country. In every direction we could see a settler's shack, and here and there more successful farmers were living in houses that would compare favourably with the average farmhouse to be seen in either Quebec or Ontario. Leaving the hills we came out in the wide open prairie at the town of Tofield. Here is exemplified in a striking manner the feelings and ideas of the westerner that nothing is impossible. Acting on this idea they have shifted their town around on three different sites. However, judging from the buildings they are now putting up they appear to have decided to remain stationary for the future.

Moving east from here to Vermilion, you pass through a town, then a thickly-settled farming district; the settlers getting gradually farther and farther apart, then



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the district becoming gradually more thickly settled till you finally come into the next town, and so on from town to town; good graded roads are found on either side of the towns, and between them the old travelled trails.

We camped at night near farmhouses where the owners, with happy and contented minds and a great faith in the future, were generally speculating on the number of bushels to the acre, the price, and if they could afford to go east this year to see their friends or wait till next year.

Completing this survey I moved to Hewitt Landing and started in a northerly direction to Cold lake to commence the inspection of survey contracts. We arrived at Cold Lake Indian reserve on July 15, and at the Roman Catholic mission I visited one of the best vegetable gardens that I ever saw in any part of Canada. Everything in that line was growing luxuriantly, and not a weed was to be found inside the boundary fence. The reserve has a black loam soil, varying in depth from ten to thirty inches, but little farming is carried on by the Indians. However, the government is starting an Indian farm and last summer had two hundred and fifty acres broken. This, no doubt, will be an incentive for the Indians, as game is getting scarcer every year and now the reserve is almost surrounded by white settlers.

We forded Beaver river and moved north to Cold lake, where about a dozen families are settled. The soil is good for at least eight or ten miles around the south and west parts of the lake, and the lake itself is teeming with whitefish, jackfish and trout. One evening the men caught about two hundred and fifty pounds of the latter, which we salted and brought with us for future use.

From Cold lake we moved westward to lac la Biche. The soil between the lakes is suitable for farming purposes except a strip about ten miles wide near Punk creek or Sand river as it is known in the district. On this strip are rolling sand-hills and tamarack swamps. A very good country is to be found around Beaver lake, which, I might say, is covered in most places with four to eight-inch poplar and scattered spruce; the latter runs from eight to twenty inches in diameter, but is not found in sufficiently large quantities to warrant the establishment of a sawmill, although there is ample for the requirements of settlers. My survey party was the first to open a trail from Cold lake to lac la Biche. La Biche settlement, one of the oldest in the west, has not improved or changed in the last ten years. This is not to be accounted for by a poor soil or climate, but is due to the settlers themselves. They are half-breeds and not inclined to follow agriculture. Fishing, hunting and freighting give quicker returns for their labour and they are always in want of money so earned. White settlers have not yet started to settle the district, the reason for which, I believe, is the roundabout way to get there from Edmonton, the natural landing place for all newcomers. They would have to go first to Saddle lake, thence north a hundred miles, making about two hundred miles in all, while in a direct line the distance does not exceed one hundred and ten miles. No doubt when railways are constructed in that district it will soon be settled, and many more acres will be added to those under cultivation in the province.

Settlement is somewhat retarded along the north shore of the Saskatchewan from Edmonton eastward, and apparently the cause is the distance from a railroad and the difficulty of marketing produce. I do not hesitate to say that a railway must be built, and built soon, from Battleford west, as the country is too large and fertile to remain idle much longer.

Leaving lac la Biche we went westward over a very bad road to Athabaska Landing. The trail follows Pine creek for a distance of seven or eight miles and there passes through a large colony of negroes. From the Landing I went north, following the Lesser Slave lake trail. This road is in poor condition and the future traffic to the north country would warrant the spending of considerable money for its improvement. There are practically no settlers north of Athabaska river, although the country is fairly good agricultural land. A few large tamarack swamps that may be



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easily drained will make as good a country as man would want to live in. I returned the way I went to a distance of about thirty miles south of the Landing, where I turned straight east to examine six contracts. I borrowed a pack outfit from another surveyor and started with six weeks' supply of provisions. The country south of township 61 and west of range 17 is practically tamarack swamp; the remainder will **make good farm land**, but at present it is covered with poplar or scrub and a few patches of spruce. The soil consists of a few inches of black loam with a clay sub-soil.

The inspection of these contracts completed, I returned to Edmonton, placed my horses in winter quarters and with a small party went by trail to Olds. Here I engaged a couple of teams and went west to inspect townships 31 and 32, ranges 6 and 7, west of the fifth meridian. These townships are well up in the foot-hills and consequently very hilly and rolling with practically no wagon trails leading to them; nevertheless, the settlers here seem to be more enthusiastic about a railway being built through their territory than those of other parts of the province. They insisted on showing us the easy location through their quarter sections and did not regard the high hill at one end of their proposed railway and the deep ravine at the other as obstacles; in fact, they are only interested in having the station conveniently close to their shacks.

After completing this inspection I returned to Olds, left the horses with their owner, and took the train back to Edmonton. Here I stored my outfit, discharged the remainder of my party, and left for home, arriving at Ottawa December 12.

I have the honour to be, Sir,

Your obedient servant,

G. J. LONERGAN, D.L.S.



## APPENDIX No. 32.

## ABSTRACT OF THE REPORT OF C. F. MILES, D.L.S.

## INSPECTION OF CONTRACT SURVEYS NEAR BATTLEFORD AND MISCELLANEOUS SURVEYS IN SASKATCHEWAN AND SOUTHERN ALBERTA.

I left Toronto on May 17, 1910, for Maple Creek, south of which place I commenced work, reinspecting contract No. 8 of 1909.

Establishing the remaining monuments in township 24, range 4, west of the third meridian, was accomplished by the 23rd, and on the following day we left for Maple Creek, arriving there on May 30. After outfitting there, we left again for Battle Creek post-office, and thence started for section 31, township 3, range 28, in Mr. Kimpe's contract No. 8 of 1909, arriving there on June 2.

I completed the reinspection here on the 3rd and the following morning started for township 3, range 3, west of the fourth meridian.

I reinspected a block of four sections there, completing the work on the morning of June 7, when we left for the Hooper and Huckvale ranch on Manyberries creek, passing on our way the Penlan ranch, where we saw a number of horses, but no cattle. North of this ranch several new settlers' shacks were passed, and quite a few new houses were observed at a distance to the north.

Owing to the late and dry spring, the outlook for the new settlers did not appear propitious, and I was credibly informed that several contemplated moving to another section of the country where the rainfall is somewhat heavier than in this southern country. I have stated in previous reports that I consider the country along the international boundary fit only for horse and cattle ranching; nevertheless, homesteaders crowd in there, break up the land and then abandon it as being too dry. After the land is broken up it is fit for nothing, the native nutritious grasses being exterminated and a rank growth of weeds taking their place.

From there we travelled on to section 9, township 8, range 8, passing Spring lake on the way in the vicinity of which there are several sheep camps. One of these belonging to Mr. Young aggregates 10,000 head of sheep. His main winter camps are in the vicinity of lake Pakowki.

We completed the reinspection of contract No. 8 of 1909 on June 11, and on the following morning started on our return across country, passing through a fairly well-settled country towards Maple Creek.

On the arrival of my outfit there on June 15 we stopped over a day to lay in a supply of provisions and engage a few more men, then left for township 14, range 25, west of the third meridian, where I was to make a restoration survey of several townships around Bigstick lake.

From the valley of Maple creek north, the country is well settled, the soil consisting principally of a sandy loam, but on approaching the lake it becomes lighter until in the immediate vicinity of the lake to the southeast and east it becomes almost pure sand and shifting sand-hills.

Cattle and horse ranching is carried on here on a limited scale. Though the soil is light the vegetation appeared to be of a fairly vigorous growth.

Although the vegetation here was more luxuriant than in the south, yet the short grasses of the south are much preferred by cattle and seem to contain greater fattening qualities.



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I closed my work here, leaving the northerly one-third of township 15, range 25, undone, and started for Maple Creek on July 11 with the intention of shipping my outfit and horses by rail to Prince Albert.

I arrived at Prince Albert on the 15th, but had to wait for the car containing the wagons, harness, &c., until the 22nd, an exceptionally long time between Maple Creek and Prince Albert. However, I hired some teams to take us out to township 48, range 27, west of the second meridian, where my restoration surveys were to commence.

I noticed a gradual improvement in crops and verdure generally after leaving Maple Creek.

From an agricultural point of view, the soil on the prairie, more particularly in southern Saskatchewan, is generally composed of a stiff clay, verging on hardpan, whereas the soil in a bluffy or wooded country has a greater or less covering of vegetable matter or humus, making the latter more productive than the former. The latter is frequently underlaid by a light sandy soil, which, while producing more luxuriant vegetation, does not demand the same amount of humidity as the heavier clay soils.

From Prince Albert I first moved west, north of Saskatchewan river. It is nearly all wooded, except where fires have destroyed the timber; there is a great deal of jack-pine, which indicates a light sandy soil. Near the banks of the river vegetation is generally more exuberant in growth, and the soil, although sometimes light, is overlaid by a covering of decomposed vegetable matter.

A few settlers are scattered along the north side near the river, but on the trail leading to Shellbrook there are miles of sandy stretches covered with jackpine and unfit for settlement.

A railway is constructed from Prince Albert to Shellbrook, but no regular trains were running at the time. When once in operation it will probably result in opening up the good country said to be in the Shellbrook district.

After completing the resurvey of fractional townships 48, ranges 27 and 28, I moved eastward, passing Prince Albert along an old trail, fair in places, but rather rough where cut through the woods in township 49, range 24.

I completed the resurvey of this township on September 9, and after making a traverse survey of Badger island, which is thickly wooded and is a part of this township, I returned to North Battleford, going by the Canadian Northern railway from Prince Albert.

My outfit arrived at North Battleford on September 15, and after repairing wagons, shoeing horses and purchasing supplies we left North Battleford on the morning of the 17th, taking the Jackfish lake trail for the scene of my inspection work in the vicinity of Turtle lake.

North Battleford, altogether distinct from old Battleford, lies on the north side of Saskatchewan river and is a growing town and separate municipality. It has outstripped old Battleford, south of the river, and has a population of about 1,500. Anything a settler may require can be purchased there, and this town seems destined to become the distributing point for a large district to the north. So far it is the only place of any importance on the north side of the river, being always accessible, regardless of the state of the river.

A good traffic bridge spans the river from the north town to the south town, being a drive of about three miles, whereas by rail the distance is about fifteen miles.

After travelling for about thirty miles along the old surveyed trail, running northwesterly from North Battleford and nearly parallel to a branch of the Canadian Northern railway, we touched the western shore of Jackfish lake, a large sheet of water, slightly alkaline, where quite a little settlement has sprung up with the expectation of this becoming a future summer resort.



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At Jackfish lake we left the old surveyed trail, which continued northwesterly to the Onion Lake Indian reserve and mission, and followed the trail that runs in a more northerly direction called the Turtle lake trail. The country in this vicinity seems very well suited for farming.

Brush and scrub became more frequent as we proceeded north, and when at last we reached the vicinity of Turtle lake we entered almost solid bush.

On the south half of section 26, township 52, range 19, at the outlet of Turtle lake, there is a store or trading place kept by a Mr. Warner, an old trapper and trader.

From the outlet of the lake one follows a narrow Indian wagon road, cut northerly through the bush on the west side of the lake to township 54, range 19, west of the third meridian, this being a part of contract No. 9 of 1910.

This township and the whole of this contract may be more easily reached from the south by a trail that runs westerly from Warner's store on section 26, and thence westerly and northerly east of Brightsand lake.

In the westerly part of this township there are some openings, the timber having been cleared off by repeated fires, but north from here it is nearly all solid bush.

The open parts may be made available for homesteads almost at once, and on the northeast side of Brightsand lake up to range 24, township 54, there are areas of open country, but northerly it is more densely wooded.

Trails to Loon lake and to Meadow lake, north and northeast of these contracts, pass through these townships, and are travelled principally by Indians and half-breeds who are settled on those lakes.

At Meadow lake there are said to be a number of settlers, principally half-breeds, and also a couple of trading posts.

These trails in the fall were in a very fair condition, but in the spring or in a wet season there must be many places too soft to pass through with wagons. The soil is mostly a black loam, averaging only about three inches in depth, the subsoil varying from white sand to sandy and white clay and hardpan.

Wherever openings are found they are adapted to immediate settlement.

Many trails, that may be utilized in the future by incoming settlers, have been opened out in this district by contract surveyors.

Westerly from range 23 a great many lakes and ponds are found. There are said to be fish in some of them, more particularly I may mention Ministikwan lake in township 58, range 25, on the north side of which there is a newly-surveyed Indian reserve where the Indians were catching whitefish.

In some townships to the north, thousands of tons of hay may be cut in the meadows and many haystacks were seen that had been put up by the Indians for stockmen who were driving their cattle in from the south. Part of this district might be an ideal cattle country, providing the flies were not too troublesome. Domesticated cattle would suffer terribly in a bad or wet season, as at times the little black-fly the worst pest, and the large bulldog fly would become unbearable unless the animals were properly protected with smudges and had sheds for shelter.

Range cattle may possibly be more hardy, and may be better able to withstand the plague of flies and mosquitoes. Cattle, ranging on the open prairie, have not the black-fly to harass them. The past season neither mosquitoes nor black-flies were so numerous, but the latter lasted long into the cold weather, even after several severe frosty nights.

This part of the country is not yet ready for immediate settlement on account of its being almost entirely covered with dense bush or brush.

We finished the inspection work of contracts Nos. 8 to 13 on November 14, and my party broke up camp and started for Onion Lake mission or settlement on the following day.

After completing the subdivision of the dry bed of Many Island lake near Walsh, I closed operations for the season on December 14.



## APPENDIX No. 33.

## REPORT OF R. D. McCAW, D.L.S.

## EXAMINATION OF LANDS IN THE RAILWAY BELT, BRITISH COLUMBIA.

CALGARY, February 16, 1911.

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa.

SIR,—I have the honour to submit the following report regarding my operations during the past season in connection with the examination of lands in the Kamloops district of British Columbia.

On May 9 I began the necessary preparations for the season's work, and shipped to Savona, B.C., the packhorses and outfit provided for my own party. I left Calgary on May 12 and stopped off at Kamloops to make arrangements for different items, proceeding to Savona on the 14th.

My first camp was located on Three-mile creek, about five miles southeast of Savona, and examination started in the immediate vicinity. In the meantime I had received word that A. V. Chase, of Orillia, Ontario, had been appointed to take charge of a sub-party which I was to have, and I proceeded to get a party and outfit ready to place in his charge.

With this intent I went to Kamloops and engaged a cook and one man, and also procured part of the camp outfit. On May 24 I went to Calgary to ship packhorses. Owing to delays in getting the horses from Logan's ranch and in getting a car for shipping, I was detained until May 31. On the 30th I had shipped the horses and other necessities for the outfit in charge of J. E. Smith, whom I had engaged as packer. I reached Kamloops to find that one man whom I had engaged did not put in an appearance, so engaged another and proceeded to Savona on the morning of June 2, and finding that Smith had arrived with the car, at once proceeded with the outfit to my own camp.

During my absence my assistants took charge of the work which I had laid out for them before my departure, and Mr. Chase arrived in camp on May 30.

Camp was then moved to Tunkwa lake and Mr. Chase was assigned a party and outfit to commence examination in that vicinity, working upon the instructions I had received. I then moved my camp south to the junction of Guichon creek and Meadow creek and commenced examination in that vicinity. I then directed my movements westerly through Highland valley along Witches brook and Pukaist creek to Thompson river. I had made arrangements with Mr. Chase whereby he would conduct the examination in townships 18, ranges 21 and 22, and also north of the correction line between townships 18 and 19 to Thompson river. South of this and as far as Nicola river I examined personally, and visited Mr. Chase's camp on June 24 to see how he was progressing.

On the 30th I moved camp to Spence's Bridge. Owing to there being no road for part of the way from Spatsum to Spence's Bridge on the east side of the river, I was compelled to send the wagons to Spence's Bridge via Ashcroft and the road on the west side of the river. Work was then proceeded with on the north side of Nicola river. Camps were located at convenient intervals along the river. The examination was concluded in this area on July 30.



On Monday, August 1, I started to move towards Long Lake Forest reserve. It took me three days to make the trip and locate a camp. The move was made via Lower Nicola and the Nicola-Savona road along Guichon creek and by a settler's road along Meadow creek into township 17, range 20.

By previous arrangement between Mr. Chase and myself it was agreed that he should continue the examination between the fifth correction line and the Thompson valley east to the west limit of Mr. Wheeler's examination of 1909, while I continued the work south of that correction line to the said west limit of Mr. Wheeler's examination.

From August 4 until the 31st I was engaged upon examination in townships 17 and 18 in ranges 18, 19 and 20. Camp was moved along a settler's road following Meadow creek to Trout lake, and then along the graded road constructed from Kamloops to Trout lake. During my stay in this vicinity we had a number of rainy days and experienced the coldest weather during the season, the thermometer registering as low as eleven degrees towards the end of the month.

On August 22, in accordance with instructions from me, Mr. Chase met me in Kamloops and I assigned further work for his party in the Monte Hills and Martin Mountain Forest reserves and lands adjoining that were unexamined.

When the work of examination was completed by me in the Long Lake Forest reserve area, I proceeded to the Niskonlith Forest reserve via Kamloops, and commenced work in that vicinity from a camp located in the northeast corner of township 20, range 15. The next main camp was located near Louis lake, and I then moved to the northeast corner of township 21, range 15, locating my camp beside Louis creek on September 27. From this date on rain and snow greatly retarded work in this locality, so much so that I was losing time. Feed for the horses was getting scarce and I could not procure hay from the settlers. Taking these matters into consideration, I decided that the work of examination to the north of Niskonlith reserve not already done could not be made at that season, so on October 11 I moved my camp to Kamloops en route to Tranquille Forest reserve, where I knew there was feed for the horses and less wet weather in that locality at this time of the year.

On October 13 I located a camp near a small lake in section 34, township 21, range 18, and commenced work in the Tranquille Forest reserve and vicinity. From this camp work was done north and northeast, closing on my examination of 1909 under the direction of A. O. Wheeler, D.L.S. The last main camp was located at Watching creek near the south limit of Tranquille Forest reserve on October 29. In accordance with instructions given him to join me when he had completed examination in the Monte Hills and Martin Mountain reserve and vicinity, Mr. Chase arrived at my camp on November 9 and assisted me in the remaining work that could be done during the remainder of the season. Snow greatly hindered the work during November and I broke up camp on November 21 as it was becoming impossible to accomplish a full day's work.

I paid off all the men except Mr. Chase and the two packers, and on November 23 shipped a car with horses, pack-saddles, &c., to Calgary in charge of one of the packers. I arrived in Calgary on the evening of the 24th, and the car with the horses arriving on the 26th I sent them out to Logan's ranch in charge of the packers, where I had procured winter quarters for them. The packers were paid off on the 28th upon their return from Logan's.

Many times during the season it was exceedingly difficult to obtain feed for the horses. Pasture was poor and the hay crop a partial failure. Often in order to feed the horses I was compelled to pay high prices for pasture and hay.

In conducting the examination the methods employed were similar to those used by Mr. Wheeler in his previous work of examination.

When the lands examined were situated within surveyed territory the survey lines were traced out and sections traversed in such a manner that an intelligent



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report could be prepared describing the lands. In unsurveyed territory traverses and approximate production of the township subdivision lines were made to locate the areas reported on.

Traverses used as bases for examination were either run out by compass and chain or with stadia.

Throughout, in examination, lines were dependent on box compasses for direction and pacing for distance, with the assistance of tally-registers. Elevations were referred to sea-level and were determined by means of aneroid barometers carried in the field by the examiners and compared for fluctuation of atmospheric pressure with stationary aneroids in camp which were read every two hours throughout the day. Elevations along the Canadian Pacific railway and other elevations on the Kamloops and Sicamous sheets according to James White, F.R.G.S., Geographer, were used as authority for altitudes. Records of maximum and minimum temperatures were taken throughout the season.

The report of A. V. Chase, D.L.S., who had charge of the sub-party is annexed. I have the honour to be, Sir,

Your obedient servant,

R. D. McCaw, D.L.S.

REPORT OF A. V. CHASE, D.L.S., ON OPERATIONS IN EXAMINATION OF LANDS IN KAMLOOPS  
DISTRICT, 1910

CALGARY, January 26, 1911.

R. D. McCaw, Esq., D.L.S.,  
Calgary, Alta.

SIR,—I have the honour to submit the following report on my operations in examination of land in the Kamloops district during the months of June to November, inclusive, season, 1910.

In compliance with the instructions of the Surveyor General to report to you at Savona, B.C., I left Orillia, Ont., on May 25 and reached Savona on May 30. On the arrival there of your packer I proceeded at once with him to your camp on Three-mile creek the same day. As work from that camp was then about completed. I waited for your arrival with my party and outfit on June 2.

After completing the distribution of men, outfits and supplies I moved camp to Tunkwa lake in township 19, range 21, west of the sixth meridian, on June 3, where I commenced work for the season examining lands convenient thereto.

On June 15 I moved camp into Guichon creek valley to a point near the north-east corner of section 19, township 18, range 21, and examined the lands in and adjacent to this valley, using this as a main camp for most of the work, which was completed from a flying camp in the valley just south of the township.

On June 24 I moved the main camp to a point near Divide lake in Highland valley, leaving one tent and two assistants to complete the work in Guichon creek valley, which they did, and arrived at main camp on the following day. As the country to the north of Highland valley is very high and of little value, only a few days were necessary to examine and describe it, so I was able to complete this part from two other camps in Highland valley and move camp to Spatsum on July 5.

From here work was continued along the bench land on Thompson river and back into the mountains to the east. As there was no feed for the ponies in the eight-mile



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stretch between Spatsum and Thompson's ranch on lot 95, and no drinking water except at these points and in Thompson river, these places were used as camping grounds for examination of this locality.

On July 15 I moved camp to the north end of Barnes lake and continued examination of lands in the vicinity of Ashcroft and to the southeast, moving up Barnes creek to examine lands to the southeast and adjacent to Glossy mountain, on July 20.

From here work was continued easterly examining undisposed-of lands to the south of Thompson river to close on work done in the vicinity of Savona in the beginning of the season. This portion was completed and our first camp on Three-mile creek again reached on August 6. Thence work was continued eastward examining lands undisposed of between the fifth correction line and Thompson river, including lands in the Long Lake Forest reserve and timber berths Nos. 420 and 330, and as far east as the lands included in the examination by A. O. Wheeler, in 1909.

On August 21 I left camp en route for Kamloops to meet and confer with you on further work, and having done so, returned and reached camp on the 23rd. This portion of the work was finished on September 13.

On the 14th I moved camp to Bulman's ranch at the north end of Trapp lake en route for the Monte Hills Forest reserve. Some little delay was here experienced, through the difficulty of finding any one who could direct me to convenient trails and none seemed to know the whereabouts of old survey lines, Mr. Bulman being absent from his ranch at the time.

However, on September 16 camp was established in township 17, range 16, near the south end of Roche lake, and work was commenced, the boundaries of the reserve traced out and examination of lands begun.

On account of the sharp and continued rise to eastward and the thick growth of small jackpine through which it was impossible to travel at much greater speed than one-half mile per hour, I found it necessary to cut out a traverse line to use as a base for operations in the interior, there being no lines surveyed within the boundaries in this part. However, on September 27 the traverse line was completed, and on account of the altitude and nature of the country little detailed examination was necessary in this locality and the work was completed in the southwest portion of the reserve on October 3.

On October 4 camp was moved to a point east of Fish lake and north of the reserve. Similar proceedings were necessary here, but great assistance was rendered by J. A. Bleeker, a rancher, who went to much trouble to show us the trails in this part and the lines surveyed in the locality. Examination of the northwest part was completed, and moving to the eastern part of the reserve was commenced on October 18. The wagon, which my packer had brought from your camp, proved of great assistance here as the pack ponies seemed unable to stand continued long moves for more than three or four days at a time, and it would have been impossible to move our outfit and fresh supply of provisions all at one time on our ponies alone. With the help of the wagon the move to Monte lake was accomplished in three days without any loss of time. Camp was established at the south end of Monte lake on October 20 and examination of the eastern part of the reserve commenced. On account of the altitude and nature of the country here little detailed examination was necessary except in the southeast part, and the whole was completed on October 28. Camp was moved and examination of the Martin Mountain Forest reserve commenced on the east side on October 31, the examination of the same being completed on the west side on November 3.

In accordance with your instructions, I commenced the move to Kamloops on November 4, en route for the Tranquille Forest reserve to join you and assist in the completion of such work as could be done there before the close of the season. I arrived at your main camp on Watching creek on November 9, being delayed one day en route getting supplies for the remainder of the season.



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Great trouble was experienced throughout in providing feed for the pack ponies. In a great many localities grazing was burnt out or eaten off completely. Many settlers did not have enough hay for their own use, and the result was that I was compelled to buy much feed and pay rather high prices at times.

I have the honour to be, Sir,

Your obedient servant,

A. V. CHASE, D.L.S.



## APPENDIX No. 34.

## ABSTRACT OF THE REPORT OF J. B. McFARLANE, D.L.S.

## SURVEYS IN THE BRAZEAU DISTRICT IN SOUTHWESTERN ALBERTA.

I left Edmonton on April 5 and reached Prairie Creek on the 22nd. As the trails to the head of McLeod river were still blocked with snow we surveyed nine miles of line around Prairie Creek settlement.

We reached 'Indian Grave' near Southesk river in township 45, range 21, west of the fifth meridian, on May 5, and from there proceeded to the eleventh base line. While producing this base line across range 19 on May 14, we had a snowfall of ten inches, which, added to the snow still deep in the ravines, made progress rather slow.

During June and July we were engaged on subdivision work in townships 39 and 40, ranges 16 and 17. These townships can be reached by a trail along Saskatchewan river from Red Deer or Lacombe via Rocky Mountain House. There is also a pack-trail from Laggan through the mountains.

This district is valuable only for its coal deposits, as the short season with frost and snow every month renders agricultural pursuits impossible. That ranching could be carried on is doubtful, as grass is scarce, except in some of the valleys, where it would be difficult to cut on account of the willow growing among it. However, some Indian ponies and cattle were seen which had wintered out.

The country is generally rough, and the Saskatchewan valley crossing township 39, range 16, in a northeasterly direction is bounded by high hills on either side. The Bighorn mountains occupy a large part of township 40, range 17, and these are surrounded by high rocky hills. The soil varies from sand and fine clay, gravel and stones, to solid rock, and the loam on top is usually thin. The land is covered for the most part with scrubby timber, but it is more open along Saskatchewan river. A few small areas of good spruce timber are located in the west and north parts of township 40, range 16. Water is plentiful in the numerous creeks. Power might be developed from the rapids on some of the creeks, but the only distinctly valuable natural power is at the 'Falls' on Bighorn river. This consists of two falls, the upper fifty-one feet and the lower thirty-four feet, and only a few chains apart. Wood fuel is plentiful and coal outcrops were seen over a considerable area. No stone-quarries are opened and no minerals were noticed. The game consists chiefly of deer, black bears, a fairly plentiful supply of partridges, a few beaver and other fur-bearing animals.

We left Bighorn river on July 26 by the well-worn trail to the north and camped near the twelfth base in range 21 on August 1. Here we ran the twelfth base across ranges 21 and 22 and the outlines of township 45, range 22; we also subdivided a large portion of this township and ran seven miles in the southwest corner of township 46, range 22.

This district is reached by pack-trails along Embarras river, thence to Brazeau and Southesk rivers, or by going up McLeod river and following either its easterly or its main branch, or again by travelling from Prairie Creek to the McLeod and thence along this river. This latter route was used as it avoids many crossings of the McLeod and is more convenient to places where feed can be bought.

This district is unsuitable for agriculture on account of the short season, with frost and snow every month, and is chiefly valuable for its coal deposits, some of which are of considerable size. Veins have been opened twenty and twenty-four feet



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thick and yield a fair quality of soft coal which, it is stated, will coke. The country is mostly rough with many rocky hills; a mountain range crosses the middle of the west boundary of township 46, range 22, running southeasterly across the northeast corner of township 45, range 22, then dropping in altitude in the next range. Bare hills above timber-line cross the west and south boundaries of township 45, range 22. The valleys not drained by large creeks or rivers are usually very soft muskeg so that trails are bad in some places. The surface is mostly covered with small jackpine and spruce, and though some places are valuable for tie timber, the trees are usually too small for lumbering purposes. A patch of spruce of good quality, but not very large in extent, stretches partly up both sides of the mountain on the east boundary of township 45, range 22. There is no hay, but a number of meadows producing 'bunch-grass' afford good pasture all summer. These meadows are all formed by creeks, usually running underground and flooding the meadows after rains or when snow melts. Water is plentiful and fresh in the numerous creeks. It rained twenty-three days in August, the rain usually turning to snow, especially in the latter part of the month. In September and October also a great deal of wet snow fell. Creeks and rivers have rapid fall so that power might be developed by dams. Wood fuel is everywhere plentiful as well as coal. No stone-quarries are opened nor were any minerals of economic value seen. Game consists of deer, caribou, mountain-sheep, bears and a few small fur-bearing animals.

On account of the great amount of snow I was obliged to close my operations for the season on October 21. I arrived in Edmonton on November 3, where I disbanded and paid off my men.



## APPENDIX No. 35.

## ABSTRACT OF THE REPORT OF GEORGE McMILLAN, D.L.S.

## SURVEY OF PARTS OF THE SIXTEENTH, SEVENTEENTH AND TWENTIETH BASES WEST OF THE SIXTH MERIDIAN.

I left Edmonton March 18, and crossed the Athabaska on March 23. This was the last crossing made on the ice that spring, and at the Landing we had to exchange our sleighs for wagons. Grouard was reached April 3, but we were delayed at Little Prairie by sickness in the party and because the ferry at Peace River Crossing was not running until April 26. Saskatoon lake was reached on May 5, and our starting point on the seventeenth base on May 26.

The survey was begun in the middle of range 9 where the rise to Nose mountain begins. This mountain is simply a hill higher than any of the surrounding hills. It is a series of three crescent-shaped ridges with the concave sides facing north. It is about four miles long from east to west, and twelve miles north and south. On the north slope, which is timbered, many small streams rise which converge about four miles north, and flowing northwesterly through a valley six hundred feet deep empty into Nose creek about twelve miles north of the base line, which in turn empties into Red Deer river in township 68, range 11. Small poplar and willow grow on both sides of the valley, but there is no marketable timber. The soil above the valley is burnt to a cinder and the boulders are cracked and crumbling from the heat of the fire which swept this district. Willow scrub is beginning to grow.

The general surface north of the line may be described as rolling, with some scrub. When new soil forms here the land will be suitable for farming, and this is the only land along the portions of the sixteenth and seventeenth base lines surveyed this year that will be suitable. Coarse wiry grass grows everywhere, but there are no hay lands.

The valley of Nose creek is about three hundred feet deep and about three miles wide. Some good spruce and poplar grow here and become thicker and larger to the north.

North Sheep creek, which is about four and one-half chains wide, rises in the glaciers, and flowing through a valley about three miles wide and four hundred feet deep, empties into Wapiti river in British Columbia. Its west banks are so steep and slippery that horses cannot climb them. The surface to the west has been burnt over and only isolated patches of green timber remain.

Cutbank river rises in Nose mountain in range eleven, about four miles south of the base line, and flows east to Smoky river. Its valley is strewn with dead timber through which is growing a thick jackpine scrub. The lands above are about the same. At the southeastern extremity of Nose mountain there is a berth of green timber about six miles by two miles. This timber is suitable for ties and with that in the Porcupine valley is the only merchantable timber between the sixteenth and seventeenth base lines and Nose mountain and Smoky river.

The seventeenth base line was completed on July 2, and our starting point on the sixteenth base line at the northeast corner of range 5 was reached on July 19. To reach this point we travelled by the Nose creek trail over Nose mountain and other great hills and then across a series of swamps to Porcupine river. North of the Porcupine, near the trail, is a prairie about five miles long and twenty chains wide; the grazing here is good.



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Porcupine river is a swift mountain stream from three to ten feet deep, about five chains wide and having a current of about three miles an hour. It rises and falls rapidly; it may be possible to ford it in the morning and by evening it may be three feet deeper.

The country along the sixteenth base in ranges 5, 6 and 7 comprises an area of high dome-shaped hills covered with large fire-killed spruce and jackpine. The fire here was more recent than farther north and the trees are still standing firmly rooted. In range B there is a forest of green spruce and jackpine, extending about six miles southwesterly. This contains considerable marketable timber fit for ties and lumber.

The valley of the Porcupine was entered in range 8, and the base line continues in this valley to its crossing in range 11. To the south of the valley is a series of hills extending back to the Rockies, which in range 9 are about ten miles south, in range 11 about five miles south, and intersect the line in section 32, range 13. Range 11 west of the Porcupine is hilly, and the mountains may be said to be entered at the beginning of range 12, although the obstruction was not sufficient to stop the work until section 32 in range 13 was reached.

Ranges 12 and 13 are well timbered with fir, spruce, jackpine and balsam. This timber is accessible by both branches of Stinking creek. They rise in the mountains and converge in range 13, and flowing north and west empty into North Sheep creek in British Columbia. The west branch is about two chains wide, two feet deep and very swift, and has a valley averaging about three miles wide and eight hundred feet deep.

On October 12 I left for Grande Prairie and the twentieth base line. We followed the trail by way of the west branch of Stinking creek, Two lakes, Nose creek and Jasper trail, to Grande Prairie. After a few days rest here to allow the horses to regain their strength, we left by wagon road for the twentieth base line on October 26. A snowstorm came on unexpectedly on November 2, and we were delayed some days awaiting the arrival of our flat sleighs from Grande Prairie, and did not reach our starting point at the northeast corner of range 13 until November 21.

Ranges 15 and 16 contains some poplar, spruce and jackpine timber suitable for building, ties and lumber. Range 17 is hilly and largely covered with fallen timber and jackpine scrub.

Pouce Coupe prairie begins in range 14 about eight miles north, and runs in a northwesterly direction to Kiskapiska river. The prairie is rolling and scrubby, and appears to be the result of forest fires. The soil is a rich clay loam with a white clay subsoil. It comprises hay lands and sufficient timber for fuel and building purposes, but surface water is scarce. There is a community of five families of half-breeds and eleven white settlers on the prairie, now located in about township 78, range 14.

In June and July the thermometer registered from 60° to 110° in the daytime but the nights were cool. August was very wet, and mists and fogs were prevalent. A snowfall of one foot occurred on August 22 and 23, and the leaves were shed by September 1. On October 11 the ponds were frozen over, and there was an inch of frost in the ground and four to six inches of snow. Real winter began November 2. Snow fell almost every day during the month, and the thermometer varied from 0° to -40°. December was fine but in the last of January -60° was registered.

Fresh water is abundant everywhere, no bad water being met with all season. There was an absence of mosquitoes and kindred pests.

No minerals were met with but many of the boulders scattered over the district carry iron. Springs in the vicinity of Nose mountain deposit a white solid substance like lime, but the water is tasteless and colourless. There is considerable building stone along the tributaries of the Porcupine.



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Moose are plentiful everywhere, and grizzly and black bears roam in great numbers south of Red Deer river. Foxes, marten and lynx are almost extinct. Muskrats are numerous, but there are no beaver. Ducks and partridges are rarely seen while whitefish are plentiful. In Pouce Coupe the following animals are to be found although none of them are numerous: moose, black bears, grizzly bears, wolves, foxes, lynx, mink, marten and coyotes. Jackfish are caught in Bear creek.

All streams have sufficient natural fall for the development of water-power, but the volume of water is not always sufficient. Porcupine river and North creek have sufficient volume at all times, and Nose creek and Capton creek at high water. The building of dams would not be expensive as the banks are high and often approach the water's edge.



## APPENDIX No. 36.

## ABSTRACT OF THE REPORT OF A. L. McNAUGHTON, D. L. S.

## SURVEYS IN THE BRAZEAU DISTRICT, WESTERN ALBERTA.

I arrived in Edmonton on April 26 but my horses and camp outfit which had been wintered at Duck lake did not arrive until the 30th. We did not leave Edmonton until May 17, as the season was late and feed for packhorses scarce. The intervening time was spent in purchasing horses and completing my outfit, and in preparing returns of the surveys performed by me during 1909.

We travelled by train to Wolf Creek and from there by wagon and pack-train to 'big eddy' which we reached on May 21. Thence we travelled by pack-trail to the junction of the two branches of Embarras river about half a mile north of the thirteenth base line. From this camp we began our work on May 28 on the east boundary of range 19 southerly. We then began the survey of the east boundary of range 20 and were occupied with these surveys and the subdivision of township 47, range 19, until August 12.

An attempt was made to reach the twelfth base and run the east boundary of range 19 northerly but, having reached the Brazeau by trail along the Pembina and thence southerly, no trail could be located leading westerly along the Brazeau and we were compelled to return to township 47, range 19. On September 19, we moved to township 48, range 21 and were occupied until December 8 with subdivision surveys in townships 48 and 49, ranges 21 and 22. This district has been burned over and is covered with very dense dead timber.

On December 9, we left the field and arrived in Edmonton on the 17th. We left Edmonton again on January 9 and arrived at the coal mines of the Pacific Pass company on January 17 and following the same route as in the summer we reached the Brazeau on the 21st. By means of ropes the flat sleighs were let down the high steep banks of the river and reached the junction of the Brazeau and Southesk on January 23. We then ran the east boundary of range 9 north from the twelfth base about two and one-half miles and did a few miles of subdivision in the neighbourhood. We then moved north along this outline where we continued work until February 27. We then closed operations and I returned to Bickerdike to send in supplies for the next season. The supplies were purchased and forwarded to the Pacific Pass mines and I returned to Cornwall, Ont., on March 16.

With the exception of township 48, range 19, the country traversed during the season's work lies within foot-hills which vary in height from one hundred to fourteen hundred feet. Most of this country has been swept by forest fires and is now covered with dead and fallen timber and usually a second growth of small jackpine. The only timber of any value seen during the season is in townships 48 and 49, range 22 where a heavy spruce and jackpine forest remains as an indication of what the timber in surrounding districts must have been before destruction by forest fires. Spruce up to three feet in diameter were frequently encountered along our lines and, in the surrounding brule country, we sometimes found dead spruce of even greater size. There are also some large green spruce along Pembina river both above and below the mouth of the Little Pembina.

Good coal is found in the range of hills which forms the divide between Pembina and Embarras rivers and in the hills northwesterly from this point to McLeod river. These deposits are being prospected by two companies, the Pacific Pass Coal



company and the Yellowhead Pass Coal and Coke company, both of which have in view extensive mining operations in the near future.

At present the only way of reaching this district during the summer months is by pack-trails, of which the most convenient starts from 'big eddy' and follows south along the valley of McLeod and Embarras rivers. About five miles south of the mouth of the Embarras this trail divides, one branch following the west fork of the river to the Yellowhead Pass Coal and Coke company's property and the other the east fork to its source, thence crossing the watershed to Little Pembina river on which is situated the property of the Pacific Pass Coal company. In winter both properties can be reached by sleigh road. The Coal Fields branch of the Grand Trunk Pacific railway, now under construction will, when completed, open up this district.

Suitable land for agricultural purposes is limited to small flats found here and there along the river valleys. The largest of these I have seen is on Pembina river, near the mouth of the Little Pembina. Summer frosts are too frequent and severe to make these flats valuable other than as grazing spots for horses and cattle.

Game is very scarce, only a few deer being seen during the season. Caribou are found in the Brazeau valley but not farther north. Partridges are very plentiful in districts that have not been touched by forest fires.

During the summer months our work was somewhat hindered by rain, thunderstorms occurring frequently in the afternoons, the morning being generally fine. These clouds come from the mountains and their approach is plainly visible for hours from the hilltops. As a rule, they do not break immediately after leaving the mountains but pass over thirty or forty miles of territory before discharging their contents. The soil is always water-soaked and even the hilltops are covered with a thick spongy moss which I have seen elsewhere only on the Pacific coast of British Columbia. Fine clear nights are nearly always accompanied by frost except during the month of July. To these frosts I attribute the scarcity of mosquitoes and black-flies with which pests we had practically no trouble. "Bulldogs" were not affected by this however, and worried the horses a great deal during June, July and August.

During the winter months, the cold was not as a rule severe being moderated by frequent chinook winds. On several occasions however we experienced very severe weather, the thermometer registering fifty degrees below zero.

Good water was always available, and on Brazeau river there are opportunities for an economical development of water-power. As this must compete with coal, mined on the ground, it is doubtful if there will be any power development in this neighbourhood in the near future.

I would say that the future prospects of this district depend almost entirely upon the success achieved in coal-mining operations. Experienced miners who have visited it say that a good grade of steam coal suited for use in locomotives and for fuel can be obtained and my own observations have convinced me that the quantity is almost unlimited. The experts of the Grand Trunk Pacific and Canadian Northern railways have doubtless made a favourable report on the coal deposits as both of these companies have branches under construction into this district. Such being the case, a large part of the fuel used in our prairie provinces will doubtless come from this source.



## APPENDIX No. 37.

## ABSTRACT OF THE REPORT OF W. F. O'HARA, D.L.S.

## MISCELLANEOUS RESURVEYS IN SOUTHERN ALBERTA.

My work during the past season consisted of miscellaneous resurveys in southern Alberta, and a survey of villa lots at Waterton lakes and town lots at Pincher Creek.

I reached Milk river in township 2, range 7, west of the fourth meridian on June 29, and commenced the retracement of the township. It was also necessary to re-survey part of township 2, range 8, and the north boundary of township 1, range 7, in order to get all blocks to close within the limit allowed.

These townships are in the semi-arid district. The soil is a hard firm clay and requires to be ploughed about eighteen inches deep in order that sufficient moisture may be retained in the soil to mature the crops. The summer of 1910 was the driest on record. The prairie grass turned yellow owing to the drought, and the oats headed out when only six inches high.

After completing the surveys required in ranges 7 and 8, I proceeded up Milk river by wagon trail to range 20 west of the fourth meridian, where work, similar to that in ranges 7 and 8, was required.

This region consists almost entirely of large grazing leases, and in some cases the land has been patented.

The country here and along the entire route is practically the same, consisting of undulating or rolling prairie with heavy clay soils with a few inches of black loam on the surface. Camp was pitched on Milk river in township 2, range, 20. The water of the river is much better here, being only a few miles from fresh-water springs which feed it. The volume also is much greater. A large amount of the water of the river must be absorbed by the soil and evaporated before it reaches its outlet. The difference in the volume in range 20, and range 7, is very marked. Nearly the whole of townships 2 in ranges 19 and 20, was retraced and a large number of monuments were established to take the place of the old monuments which had entirely disappeared.

The work here was finished about the middle of September. I then proceeded westerly by wagon trail to township 1, range 27. This township is situated in the foothills of the Rocky mountains and is covered largely with pine, poplar and willow. It is suitable for mixed farming and cattle raising.

The soil is exceedingly rich consisting of six to twelve inches of black loam, with a clay subsoil, and is capable of producing large crops of vegetables. There is a bountiful supply of fresh water in the many streams, one of which is found on nearly every quarter section in the township. The altitude varies from 4,000 to 5,000 feet above sea-level. This is somewhat against the raising of cereals as there is danger of summer frosts. However, there are some farmers in the vicinity who seem to be prosperous.

There are many well-known wagon trails, leading into the township from all directions which have been opened by settlers for hauling timber, large quantities of which existed a few years ago. It has however been destroyed at intervals by fire, and that which remains consists chiefly of second-growth and dead pine. A few speckled trout can be found in the streams. Deer, rabbits and grouse are also present. After completing the subdivision of this township I moved to the Waterton lakes, having made arrangements with the Commissioner of Dominion Parks to meet me there. It was his wish to look over the ground, before the survey of villa lots was commenced.



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Unfortunately he was unavoidably detained upon other business and was unable to meet me on my arrival on October 23.

In the meantime I proceeded with the retracement of a few miles in township 2, range 27 and township 1, range 30. The commissioner arrived on November 6, and after consulting with him while going over the ground, I began by making traverses of those portions of the lakes where it was decided to survey villa lots.

The commissioner selected what he considered to be the best sites. The sites selected are those which have been chosen by campers and pleasure seekers during the last few years.

There are, however, long stretches on the east sides of the upper and lower lakes, and on the south side of the middle lake which were not considered nor visited on account of the rugged nature of the country which gives no easy means of access.

After making a plot of the traverse, I surveyed the lots in a manner best suited to the requirements of a summer resort, it being desirable that the lots front on the lake.

The locality is entirely within the Waterton Lakes park and consists partly of open country, and partly of forest, with mountains from 2,000 to 3,000 feet high surrounding the lake.

The park at present comprises the east half of township 1, range 30, the west half of township 1, range 29, the southeast quarter of township 2, range 30, and the southwest quarter of township 2, range 29, west of the fourth meridian, a total area of fifty-four square miles.

There is no other locality in western Canada, which I have seen or heard of, which can compare with the Waterton lakes as a summer resort, there being a rare combination of climate, mountain scenery, large bodies of fresh water and trout fishing. Trout have been taken from these lakes recently weighing fifty pounds. The lakes are one and a quarter, two and a half and eight miles respectively in length, and from one-half to three-quarters of a mile wide. The upper lake is the longest and extends about four miles into the United States, the international boundary cutting it into nearly equal parts. The lakes have been sounded in many places and have been found to be about 300 feet deep. The water remains perfectly clear at all times, notwithstanding its being frequently lashed into foam by the hurricanes which blow down the pass almost continuously for nine months in the year, June, July and August being the only calm months. The lakes can be reached by many well-known wagon trails, which converge from all directions, leading from all the towns and villages in southern Alberta.

It was reported that about 3,000 people spent their vacations here during the summer of 1910.

After completing this work I left for the town of Pincher Creek where I arrived on December 15.

My work at this town consisted of a further subdivision of the southwest quarter of section 23, township 6, range 30, west of the fourth meridian. The survey is very regular and in a desirable part of the town which should make the lots attractive. This was the last work, operations being closed for the season on January 4, 1911.



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## APPENDIX No. 38.

## REPORT OF THOS. H. PLUNKETT, D.L.S.

SURVEY OF FRUIT LANDS IN KAMLOOPS DISTRICT, BRITISH COLUMBIA.

OTTAWA, January 4, 1911.

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa.

SIR,—I beg to submit the following report on my surveys during the past season in the railway belt of British Columbia.

In accordance with your instructions, I left Toronto on April 3, 1910, and proceeded to Kamloops, B.C. A few days were spent in repairing my outfit and organizing my party, after which on the 13th, we left for Notch Hill, where by launch we crossed Shuswap lake and camped in township 23, range 10, west of the sixth meridian.

Our work here consisted of the survey of suitable fruit lands in township 23, ranges 10 and 11. We found a large area of good agricultural land in township 23, range 10, lying along the northerly shore of Shuswap lake, and extending back an average distance of about three miles from the water. This land lies on two main benches. The lower with an average breadth of about a quarter of a mile, extends almost the entire width of the township, attaining at section 11 a width of about half a mile and narrowing gradually toward the eastern edge of the township, while at the western edge this bench entirely disappears.

Along the northerly limit of this bench there is a somewhat steep rise reaching at the western limit of the township an elevation of about 1000 feet above Shuswap lake but rapidly becoming lower and of a much more gradual slope as its summit is traced easterly through the township. At the northeast corner of section 9 this rise attains an elevation of only 212 feet, with a slope so gradual as to permit of farming operations, and continues approximately at this elevation and slope to the eastern limit of the township, except in the westerly portion of section 10, where for a short distance it becomes rocky and precipitous.

North of the summit of this rise, lying on a gradual southern slope, is the larger and by far the more fertile of the two benches. It has an average width of about two and a half miles north and south, and extends the full width of the township east and west. This bench extends northerly to the base of the mountains, which rising somewhat precipitously, render agriculture impossible any farther north.

Portions of the lower bench are naturally somewhat gravelly, lying so close to the lake, but in the south half of section 9 and in sections 11 and 13 some rich brown loam was found well adapted to fruit or general farming. Just below this bench in section 11 there is a limited area of bottom-land of a very rich brown or black loam.

On the upper bench, the conditions for agriculture are very favourable. The soil in sections 15, 16 and 17, and in the south halves of sections 21, 22 and 23, is for the most part a rich black loam with a gravel or gravelly clay subsoil. The remaining portions of the bench have a brownish loam soil with the same gravelly clay subsoil.

This district is of course a bush country. West of the east boundaries of sections 9, 16 and 21 the timber consists principally of fir, cedar and hemlock from one to two feet in diameter. In addition to these varieties, spruce, birch and poplar up to eighteen



inches in diameter are very plentiful. The undergrowth in this portion of the township is very dense, consisting of alder and willow brush with scrub maple; clearing is a very slow process. The fact that there are very few meadows where cheap fodder can be obtained renders it out of the question for the settler to provide himself with horses, and most of the clearing until now has been done by manual labour. In one or two cases where horses had been employed, the cost of their feed at prices in British Columbia, has compelled the settler to dispose of them. Although slow, progress in this district is nevertheless steady, and gradually the settler, convinced of the fertility of the soil, is carving out of the bush a comfortable home, and finding to his great satisfaction that a very small portion of land, probably from ten to twenty acres, when cleared and looked after properly, will afford him and his family a good living.

East of the east boundaries of sections 9, 16 and 21 clearing is very much more easily done. There is in this portion a much larger proportion of poplar, small spruce and fir. On almost every homestead in this section of the township there can be found from five to ten acres that can be easily cleared and very rapidly made to produce a living for the occupants of the land.

Agriculture in this locality is as yet in its infancy, but sufficient has been done to show the fertility of the soil. Vegetables of all varieties are being raised successfully. Small fruits yield abundantly, and the appearance of the fruit is excellent. Mr. H. A. Fowler's ranch in section 18, Mr. Blake's in section 11 and Mr. Beguelin's in section 16 demonstrate convincingly what the land in this township in general will produce. In addition to these there are several farms scattered well over the township in a more or less flourishing condition. Fruit raising has as yet not had time to develop, but almost without exception the settlers have planted small orchards which, although young, appear to be in a remarkably healthy condition, presaging the future development of the country along this line.

In township 23, range 11, we found a small portion of good farming land lying along the valley of Meadow creek, and extending northwesterly through sections 13, 23 and 24 to the valley of Scotch creek. The bottom-lands are narrow, but the side slopes and lower benches can be utilized to some extent. Several fairly large meadows are found in these sections.

The soil consists of sandy loam with a clay subsoil.

The bottom-lands are heavily timbered with fir cedar and hemlock up to four feet in diameter, but the slopes and benches are covered with small fir, spruce, poplar and birch of no commercial value.

This land is elevated from 500 to 700 feet above Shuswap lake, and judging from the flourishing condition of Mr. Fowler's ranch adjoining, it has a bright future as an agricultural district.

The climatic conditions in these districts are well adapted to fruit or mixed farming. Summer frosts are sometimes experienced. A severe frost this season on the night of August 23, affected this district in common with nearly all portions of British Columbia, but from what information I could obtain this was very exceptional. As development goes on it can, I think, be safely assumed that the danger of summer frosts will be entirely eliminated. It is the practice in this district at present to delay the planting of potatoes and the more tender crops until the beginning of July, it having been found that the rapid growth during July and August causes the crops to develop so rapidly as to equal crops where seeding has been done earlier, and thus the danger of destruction by frost is eliminated.

With the removal of the forest growth, irrigation during some seasons will probably become necessary, as this district lies so close to the dry belt. However, in this respect, this locality is favoured by having excellent facilities for irrigation. Manson and Meadow creeks supply ample water, easily available. In addition, Manson creek presents several splendid water-powers.



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Until recently, the settlers in the above-described districts have had difficulty in disposing to advantage of their farm produce, but of late, a regular weekly boat service has been established on Thompson river and Shuswap lake between Kamloops and Salmon Arm. These boats stop on signal anywhere along the shore of the lake to take on passengers or freight. The owners also supply the settlers with winter work cutting cord-wood and piling it on the lake front where the boat replenishes her fuel supply or carries the wood to markets along the lake. Several merchants from towns along the Canadian Pacific railway on the south side of Shuswap lake are now contemplating a gasoline launch service to trade with the settlers. At least one of these boats owned by W. J. Smith of Notch Hill, is in commission, and two others, I understand, are to be put on in the coming spring.

Game, including deer, bears and lynx, is plentiful in this neighbourhood. The mountains to the north are a favorite resort in the fall for hunting parties in quest of big game.

Having completed our work in this locality, we moved to Adams lake, where in addition to some traversing on the lake we subdivided some land in sections 17, 18 and 19 of township 23, range 12, and sections 24, 25 and 26 of range 13.

The land in these sections adapted to agriculture is very limited. The mountain slopes in general are too steep to permit of farming operations. Occasionally small benches of good land were encountered, and these, with the somewhat narrow strip of land between the edge of the water and the foot of the mountain, provide the only land where farming can be carried on. I do not think that much activity in farming will characterize this locality. Good grazing land, however, is found on all sides, and cattle raising might flourish if sufficient hay land can be located to provide winter feed.

Fish are plentiful in Adams lake, and game, including bears, deer and lynx is to be found on the mountainsides.

Climatic conditions are favourable to agriculture. Summer frosts do occur, but are not generally of a very severe character.

Irrigation will probably be necessary but ample water can be found in almost all localities where it is required.

From Adams lake, we moved to the northerly end of Niskonlith lake in township 21, range 13, west of the sixth meridian.

In the immediate vicinity of Niskonlith lake, namely in sections 6, 7, 17 and 20 we found very little good land, except in sections 6 and 7 where there is a limited area of agricultural land.

The timber in this locality consists almost entirely of bull pine and fir, from one to two feet in diameter, with, in sections 6 and 7, some poplar and willow. The land in sections 17 and 20 and portions of 6 and 7 lies on a somewhat steep slope, which however, provides excellent bunch-grass. In the east halves of the southwest quarter of section 7, and the northwest quarter of section 6, some first-class agricultural land was found, but only to a limited extent. Irrigation too is necessary, and the source of water supply for it is not evident.

North of the lake, however, along the valley of Loakin creek we found a considerable area of first-class farming land.

Our work this season, north of the lake, included surveys in sections 29, 32 and 33 of township 21, range 13, and sections 4 and 9 of township 22, range 13, but if time had permitted these surveys could have been extended into sections 16, 21, 22 and 15 where excellent farming land exists.

Loakin creek appears to have its source in a chain of small lakes, lying about the southwest corner of section 22. If on the removal of the bush, irrigation is found necessary, ample water could be obtained from these lakes and creek.

This land is elevated from 500 to 800 feet above Shuswap lake. The soil in the bottom-lands along the creek consists of a rich black loam, with a sand or gravel sub-



soil, while farther back on the side slopes and benches the soil is a light loam, sometimes sandy with a gravelly clay or gravel subsoil.

This country is also covered with bush, fir, cedar, hemlock, pine, birch and spruce being the prevailing woods. Some fairly good patches of merchantable timber were found on the bottom-lands along the creek. This consisted chiefly of cedar. In the northwest quarter of section 4, and the southwest quarter of 9 some fine fir, spruce and cedar were found from twelve to thirty inches in diameter, so that clearing the land, while necessarily a slow process, will not present any special difficulty.

The climatic conditions render this an ideal farming and fruit raising district. Summer frosts are not severe enough to damage the crops, while in winter the district is favoured with a sufficiently heavy snowfall to protect young orchards.

Agriculture has been carried on for a number of years on the northeast quarter of section 20, township 21, range 13. Here gratifying success has been attained in strawberry culture, and a few apple, plum and cherry trees, probably about ten years old, produced excellent fruit this season, notwithstanding the fact that their condition shows neglect. If under the condition in which these few trees were found they can at least retain life, let alone bear fruit, no doubt under proper handling this locality will be found to be a profitable fruit country. Except this farm, no attempt at agriculture has as yet been made in this locality.

Our next work led us into Mabel lake country in townships 19 and 20, range 5, west of the sixth meridian, where in addition to the traverse of that portion of the lake lying within the railway belt, we planted posts along the lake convenient to suitable agricultural land, and subdivided portions of sections 26 and 27 of township 20, range 5.

This from a settlement standpoint is a new country. Lying adjacent to the Okanagan valley, twenty-five miles east of Enderby it is favoured with an ideal climate. Frosts are unknown in this district from May until November, and the rainfall seems to be sufficient to render irrigation unnecessary. If, however, experience proves the contrary, sufficient water is easily available in every locality where farming can become established.

By far the largest areas of land adapted to agriculture lie in the Frog and Noisy creek valleys.

Extending up Frog creek from its mouth in section 27, a distance roughly estimated at from six to eight miles northeasterly, there lies a valley with an average width of about one mile admirably adapted to mixed or fruit farming.

The soil of the bottom-lands immediately along the creek is of a rich black loam, while that on either side is of a brownish loam with a sand or gravel subsoil.

The land is very heavily timbered with cedar from three to ten feet in diameter, resembling very much the country on the lower Columbia river below Revelstoke. The cedar from three to five feet in diameter is generally sound, and easily handled by driving it down Frog creek and rafting it through Mabel lake to Shuswap river, down which it is taken to the mills at Enderby.

Considerable difficulty was experienced in making the surveys in this locality, owing to the fact that the beaver have dammed the country along the valley, flooding it for miles up Frog creek. Wading these meadows or rather lakes, in November, is work to which the axemen do not take kindly, and it was found advisable after having subdivided a few quarter sections, to abandon the work for this season.

At Noisy creek no subdivision surveys were made, but examination showed that a considerable area of good land lies in the neighbourhood of sections 17 and 20.

Some good bench land is also to be found in section 30 of township 19, range 5.

Deer, bears and caribou are very plentiful in this district. Beaver are very numerous, and marten and mink are also to be found.

A fairly good wagon road leads from Enderby to Mabel lake, while the lake permits of navigation throughout its entire length. Along this road the intending set-



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tlar has convincing proof in the flourishing fruit orchards and farms of what can be done in the locality. No portion of British Columbia can boast of better produce. Conditions here should lead to the early settlement of this land.

This completed our fruit land surveys, and from here we went to Ashcroft and thence up the Cariboo road, where several small surveys occupied us for the remainder of the season.

The attention of ranchers in this locality is taken up mainly with hay and cattle raising. Potatoes and other root crops are successfully raised, the former in large quantities.

Irrigation here is imperative, and very little agricultural land remains where water is available.

The only new country visited was in sections 24, 25, 26 and 35, of township 23, range 25, west of the sixth meridian along the valleys of Scottie creek and its tributaries. Considerable good level land was found in this district, and our surveys could have been greatly extended if a solution of the irrigation problem had been evident.

Small portions of sections 25, 26 and 24 can be easily irrigated, and these were surveyed. It is doubtful if the remaining areas of suitable land are sufficiently extensive to warrant the expense which would have to be incurred to provide water for irrigation.

Surrounding the above-mentioned land are large areas of excellent grazing lands, very convenient to permanent water courses, which provide sufficient water at all seasons for cattle.

We finished our work here on December 15, and concluding that the season was too far advanced to undertake any further work, left for Kamloops where the party was paid off and our survey outfit stored for the winter.

I have the honour to be, Sir,

Your obedient servant,

THOS. H. PLUNKETT, D.L.S.



## APPENDIX No. 39.

## ABSTRACT OF THE REPORT OF A. W. PONTON, D.L.S.

SURVEY OF PARTS OF THE FIFTH MERIDIAN AND TWENTY-EIGHTH AND TWENTY-NINTH BASES  
WEST OF THE FIFTH MERIDIAN.

Having organized my party at Edmonton I left on June 4, 1909, and reached Athabaska Landing on the 16th. We got away by boat on June 24 and arrived at a point on the Athabaska, about four miles above Grand rapids, on the 25th.

On the 26th we began exploring and cutting a trail northwesterly towards Wabiskaw river. In this work we were greatly retarded by wet weather and the flooded condition of the creeks and swamps. Further delay was caused by the necessity of returning to Athabaska river for supplies. On August 9 we reached Prairie river on the Wabiskaw river trail, and on the 17th arrived at Chipewyan lake. With one man I then proceeded by canoe down Wabiskaw river to Fort Vermilion, while the rest of the party went by trail to the junction of Red river and Peace river. At Fort Vermilion supplies were loaded on a raft to be taken to Red river. When within about five miles of Red river, during an attempt at mooring, the raft accidentally went over the rapids and all the supplies were lost, together with the tripods of my two transits, my level tripod and level.

Leaving my assistants to cut trails and pack hay at certain points, I returned to Edmonton by way of Peace River Crossing, Lesser Slave lake and Athabaska Landing, arriving there on October 9. I left Edmonton with other instruments on October 26 and at Athabaska Landing met my packer, whom I had instructed to return with the horses.

We proceeded by Wabiskaw across country and reached the starting-point of our surveys on December 1. The work was carried on without intermission until July 7, 1910.

By that time we had produced the fifth meridian from township 107 to township 112, had projected the twenty-ninth base across range 1 and the twenty-eighth base across ranges 1 to 17 inclusive. On July 8, we began mounding back over the lines run in 1908 and 1909 and continued until August 8. A great part of the mounding could not be done owing to the flooded condition of the country. We then closed operations and the party arrived back at Athabaska Landing September 13.

Township 107 along the meridian is generally suitable for agriculture, but townships 108, 109 and 110 are low and swampy. A chain of meadows extends across from east to west through the four townships. They are capable of producing an enormous supply of hay. Stunted spruce and tamarack are found scattered in the swamps. Township 111 is in the valley of Peace river and appears subject to flooding to a depth of 10 feet. There is much valuable spruce timber here and logs and manufactured timber can be easily got out. Some pine occurs on sandy ridges in the south half of township 112 but the north half is low and swampy.

Along the twenty-eight base between range 1 and the middle of range 3 the land is low and swampy, with occasional narrow sandy ridges, and is unfit for agriculture. But many hay meadows occur, and there is some small spruce, tamarack and jackpine. Fox lake surrounded by extensive meadows, lies in the west of range 3. The land surrounding this lake is good and well drained, covered chiefly with poplar suitable for pulp-wood. Ranges 4 and 5 south of Peace river contain good agricultural lands, but range 5 north of the river is low and wet. Range 6 is high upland with poplar



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and spruce brush, the soil having vegetable mould and fine sand with clay subsoil. Range 7 being level will require drainage before it will be fit for agriculture. In range 8 extensive grassy swamps occur, but range 9 is undulating and well drained, having a soil of from three to six inches of black mould with clay subsoil. The timber in these two ranges is poplar and spruce from four to ten inches. Range 10 is undulating but cut up by the valley of a creek. The bank of Peace river is fifty feet high. The soil is good and the timber large comprising spruce, poplar and cottonwood. Range 11 is mostly prairie, but range 12 is again cut up by Peace river. Good agricultural land lies both north and south of the river. From ranges 13 to 17 the country is level. Numerous marshes and muskegs occur and the water is strongly alkaline. The timber is chiefly small poplar.

The summer season in this district was unfavourable to the early maturing of grain, but not more unfavourable than in southern Alberta where it is hot and dry. The rainfall is ample but summer frosts are frequent.

The Cariboo mountains, north of the twenty-ninth base, seem to be eruptive in nature and there is a prospect that valuable minerals may be located there. The exploration, however, is extremely difficult owing to the lack of feed in summer and fuel in winter.

Good water is plentiful as far west as range 13, but farther west is strongly alkaline.

A power site second to few on this continent occurs at the chutes of Vermilion falls. There is another site at the confluence of Red river and Peace river. Here a head of twenty-five feet could be obtained.

Devonian limestone rock occurs in situ on the Peace river between Red river and Vermilion falls. Many of the bedded masses of this stone will make good material for masonry work.

Fish are not plentiful in this district and the Indians do not depend on them for food. Bears were plentiful and moose fairly numerous. Ducks were found in large numbers in all the ponds and lakes. Prairie-chickens and partridges were not very numerous.



## APPENDIX No. 40.

## ABSTRACT OF THE REPORT OF E. W. ROBINSON, D.L.S.

SURVEY OF PART OF THE PRINCIPAL MERIDIAN AND OF PARTS OF THE EIGHTH BASE EAST AND  
THE NINTH BASE WEST OF THE PRINCIPAL MERIDIAN.

Upon receiving your instructions dated February 24, 1910, I obtained all the information possible as to the nature of the country in which I was to work, and concluded that packhorses would be the best mode of transportation. I arrived at Winnipeg on May 2 and soon discovered that it would be impossible to procure ponies suitable for packhorses in Manitoba at anything like a reasonable price, and in view of the fact that other surveyors were experiencing difficulty in obtaining packhorses in the other prairie provinces, I decided to go at once to British Columbia where I knew I could buy without any delay as many horses as were necessary. I accordingly left Winnipeg and arrived at Vernon in the Okanagan valley on May 5. By the 7th, I had purchased twenty-three horses and on the 10th they were loaded on the car and shipped to Gimli in charge of a man I had hired to act as packer. I returned to Winnipeg to hire the men and buy my outfit and supplies, and left there for Gimli on May 18.

Gimli is a thriving little town on the shore of lake Winnipeg and is the present end of the railway. It is the market town for the Icelandic settlement in the immediate vicinity and a Galician and German settlement to the west. The fishing industry on lake Winnipeg has also assisted very materially the commercial progress of Gimli. Situated as it is on one of the few harbours on the west side of the lake, it forms a convenient base for the fishing in the central part of the lake. Unfortunately, too many of the settlers in this part of the country neglect the improvement of their farms preferring the immediate returns obtained from fishing to the slower but surer profits resulting from increased acreage under cultivation. Gimli has the advantage of an excellent supply of artesian water; in fact this can be obtained as far north as Icelandic river and possibly farther, but no wells have been drilled north of this point. It is necessary to put the wells down about ninety feet to tap the water-bearing strata, and the water rises from four to ten feet above the ground. The water, although somewhat hard, is suitable in every way for domestic purposes. Gimli is also becoming a summer resort for the people of Winnipeg and this will further assist in its progress. The horses arrived at Gimli on the evening of May 19 in poor condition after their long travel from Vernon. The two following days were occupied in arranging the outfit and on the 23rd a start was made. Owing to the horses not having been worked for some time, they had their own views about packing and a stampede occurred, which distributed my outfit near and far. Fortunately no serious damage was done, but it was the 25th before I could make another start. By this time the horses had submitted to the inevitable and no further trouble was experienced.

There is a wagon road running from Gimli to Fisher river which is in good condition, except after a heavy rainfall. Stopping houses are kept at convenient intervals along the road, although some of them are run only during the winter months, when there are many freighters bringing fish down from Fisher bay.

The party arrived at Fisher river and camped on the Indian reserve there. I had returned in the meantime to Winnipeg to hire some more men and arrange about further supplies. I travelled back by launch to Fisher bay on June 4. The land bordering Fisher river and occupied by the Indian reserve is a black loam on a clay



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subsoil. At this time of the year it was very wet, water and mud in every direction, in fact it was only by digging little drainage ditches that we could get a place dry enough to camp on. I was informed to my surprise, that it had been a drier spring than usual and I was accordingly thankful it was no worse. Fisher River Indian reserve has several stores and mail is received and despatched every two weeks.

The settlement is a well kept one and the inhabitants are prosperous, due in no small measure to the untiring efforts of the resident missionary, the Rev. F. B. Stevens, who labours to improve their temporal as well as their spiritual condition. Mr. Stevens has carried on agriculture for a few years and it has proved an unqualified success and the mission grounds furnish an excellent object-lesson of the productiveness of the country. The coarser grains all do well but wheat has not been given a sufficiently extended trial to demonstrate that this will ever make a wheat-growing district. Certain varieties of corn can be raised with success and in the autumn I obtained from the councillor at the Jackhead Indian reserve, situated about thirty miles north of Fisher river, three cobs of corn in which the grains were fully matured and well ripened. The natural grasses seem to be deficient in nutriment. Although my horses had very little work to do all summer they never seemed to thrive and as the fall approached they failed rapidly. I was told that cattle, fed in the winter with all the hay they can eat seem just to exist. Timothy has been tried and has proved a success and I am of the opinion that many other cultivated grasses would do as well. Although the summer was dry, the crops did not suffer as in the southern part of Manitoba and farther west. The first summer frost which came in the night of August 3 was sufficient to blacken the potato crop and this appears to happen most years. This is not to be wondered at, considering the vast extent of the surrounding muskegs, in some of which ice was found in the middle of summer. When the country is drained on a wholesale scale, as will be necessary to render the land available for agriculture and when clearing takes place these early summer frosts will probably disappear judging by the results obtained from similar operations in other sections of the country. All the usual vegetables thrive, such as potatoes, carrots, turnips, beets, peas and onions and Mr. Stevens' garden during August would prove a surprise to those not conversant with the possibilities of agriculture in northern Manitoba. Fisher river is from two to five chains wide at the mission and runs into Fisher bay.

I commenced the survey of the eighth base line east of the principal meridian after retracing the short portion already run. This line passes through the northern part of the Indian reserve and across a fine stretch of hay land belonging to it. Leaving the reserve there is muskeg and swamp land to the shore of Fisher bay with the exception of a narrow belt of poplar, spruce and birch growing on a natural dyke around the shore. Some two miles north on the shore of the lake is the small settlement of Fisher bay from which a large quantity of fish is shipped during the winter.

I sent the horses round by the south end of the bay to where the line meets the east shore and it was only after repeated attempts that they succeeded in reaching that point. There is a large area of muskeg and swamp extending to the south and southwest of Fisher bay. Apparently this bay at one time extended much farther to the south than at present but has gradually filled up, resulting in the present muskegs. Fisher bay is an arm of lake Winnipeg and is the scene of considerable activity during the winter fishing season. Pickerel, jackfish, goldeye, tullibee and whitefish are in the earlier part of the season caught in large numbers and shipped to Winnipeg. On the east side of Fisher bay there is a fringe of flooded land and then a ridge varying from five to twenty chains wide covered with spruce, tamarack and poplar up to ten inches in diameter. Between this ridge and the ridge along the shore of the main part of lake Winnipeg lies one immense muskeg, broken by one ridge with a general southeasterly trend, and which starts from Fisher bay at a point about five miles north of where the base line crosses. This ridge is timbered with spruce, tam-



arack and poplar up to fourteen inches in diameter. There are numerous islands scattered throughout and these generally carry spruce and tamarack of small size. The muskegs vary in nature, some consisting of partially decayed moss to a great depth, some having a clay or hard-pan bottom at a depth of two or three feet, while others are floating bogs—a semi-liquid mass of decaying vegetable matter.

There is at present very little agricultural land of any value on this peninsula, and even if the country were drained it would take some years before these muskegs could be utilized. The district is a favourite hunting ground for moose. In some of the drier muskegs moose trails were crossed every twenty or thirty yards and it was no uncommon sight to see three or four of the animals in one day. Considering the noise made by the average survey party, this is sufficient evidence of their number. One fine buck moose stood on the line and gazed with undisguised astonishment at the instrument. I was unable to use horses across this peninsula, so I hired six men as packers. I finished this line on July 8 and commenced to move camp back to Fisher river where I arrived on the 11th.

I made enquiries there regarding the country north of Fisher river through which the principal meridian would pass and found that it would be possible to use pack-horses at least up to lake St. George, so I cut a pack-trail from the Indian reserve to the south end of this lake. The trail follows the ridges and crosses only a few swampy places, so that it would be passable at any season of the year. About seven miles from the reserve and again at eighteen miles from it we crossed some burned country where there was a good growth of pea-vine and this is the only good feed my horses obtained all summer. I moved camp by means of this trail and afterwards took a supply of provisions to the south end of lake St. George. The principal meridian starting at the eighth base line runs along a ridge with some fair spruce, tamarack and poplar but soon leaves this and enters muskeg, which continues until approaching lake St. George, where another ridge is encountered, on which is some excellent spruce, poplar, and small tamarack, together with a second growth of these and other varieties. The spruce, although scattered, is a fair size, some trees measuring twenty-six inches. This was the largest timber we met with in the season's work. I reached lake St. George on August 6 and found it shallow, especially at the southern end. The northern end is deeper but the light skiffs used in the country can navigate anywhere. The water is good and fish fairly plentiful. Goldeye can be obtained at all times and jackfish at certain seasons. I was informed that a stream, Jackhead river, flowed out of the north end of the lake to lake Winnipeg and I took advantage of this to send a large supply of provisions by a sailboat from Fisher river to the mouth of Jackhead river and thence up the river by skiffs to lake St. George and by Round river to Split lake, since renamed lake St. Patrick, where I made a cache. It was owing to my being able to do this and subsequently get provisions by water down Mantagao river to the ninth base line that I was able to practically complete the work outlined for the season.

On August 8, I attempted to commence the triangulation of lake St. George, my intention being to run a series of triangles up the lake in order to calculate the chainage, and on a very clear day to produce the line up. I soon found, however, that the task was almost hopeless. The shores of the lake, especially the south end, are marshy with high reeds and rushes growing thereon, and as the land bordering the lake is so very little higher than the lake itself, it was impossible to select triangulation stations which would be visible from one another. I, therefore, ran the adjoining section lines on the west side of the lake. This line is principally in muskeg and crosses two small lakes. I crossed east to the principal meridian, and, running north, came to lake St. Patrick, and, finding the condition of the shores the same as at lake St. George, had again to resort to running adjoining section lines. I reached the ninth base line on August 26 and running easterly to lake St. Patrick found that the intersection of the base line and the meridian fell in the lake. There is a ridge about ten chains



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wide lying along the west side of Lake St. Patrick carrying spruce, tamarack and poplar up to fourteen inches. As I knew the country through which the ninth base line would run to the west, I reduced my outfit to the smallest possible dimensions and again resorted to man-packing. The following is the method I adopted. The line gang would each carry a fairly light pack, say forty to forty-five pounds, to the end of the line and leaving them there, would proceed with their work. The other men during the day would bring up the supplies and the rest of the outfit and make camp, the line gang returning to that point at night. This was the daily routine and although the life was a strenuous one and totally devoid of the least suspicion of comfort it was the only method by which satisfactory progress could be made. My information about the country was correct; to all intents and purposes the whole country is a muskeg. There are narrow ridges running approximately north and south but they are only a few feet above the surrounding country and, as the soil appears to be very retentive of moisture, even these are usually wet. Moose are very plentiful here and as they are little hunted are easy to obtain. On September 7, I reached Mantagao river which at this point is a stream from five to ten chains wide and about fifteen feet deep, with a sluggish current. It rises in some muskegs to the south and pursuing a very meandering course flows into Sturgeon bay of lake Winnipeg. I was informed that there is a dry jackpine ridge extending all the way from Fisher river settlement up to Mantagao river, but I had no time to investigate the truth of this. I had previously sent my assistant back to lake St. Patrick to superintend the taking of some supplies by skiffs from my cache there around to Sturgeon bay and thence up Mantagao river.

Proceeding westerly along the ninth base line, we crossed the same class of country—muskegs separated by narrow ridges.

On September 10, three inches of snow fell, but this all disappeared in two or three days. Frosts were of almost nightly occurrence. On September 16 we reached the marsh bordering lake St. Martin and procuring a boat from the Indian reserve to the south, proceeded to triangulate the lake. I found without much difficulty the end of the ninth base line already established on the west side of lake St. Martin, and triangulating to it, found the error of closing. On the west side of the lake the land is higher than on the east side and the soil is good. It was a welcome relief to walk on dry land after the months of never-ending muskegs.

According to instructions, I reran the ninth base line, distributing the closing error, back to lake St. Patrick and arrived there on October 11.

I then continued the production of the principal meridian to the north, although I found it necessary to run adjoining section lines until the north end of lake St. Patrick was reached and from there I was able to keep to the meridian. The country passed through is very similar to that described along the ninth base line and I used man-packing for camp transportation throughout. A heavy fall of snow occurred on October 22 and this remained on the ground making work even more disagreeable. We reached lake Winnipeg on the 26th.

I moved most of the outfit back, by means of a skiff, to lake St. George while the party returned by the line to lake St. Patrick. The weather was steadily getting colder and I was afraid of the lakes and creeks freezing up, so made the best possible speed. I arrived with the boat on lake St. George on the afternoon of the 29th and camped on an island. That night we had a severe frost and in the morning I found that lake St. George was frozen across. The party arrived at camp that afternoon having managed to cross the ice on lake St. Patrick with small loads. I waited several days hoping that the ice would become strong enough to enable us to bring the whole outfit down to the south end of lake St. George by means of hand toboggans. Snow, however, fell and the weather turning mild, I saw that it would be necessary to wait for some time and then get the outfit out by dog trains. We, therefore, proceeded to Fisher river where I endeavored to procure these. The fishing season on lake Win-



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nipeg had just begun and considerable difficulty was experienced in obtaining the necessary dog trains. I left my assistants to superintend the bringing of the outfit from lake St. Patrick while I proceeded to Gimli with the horses. I left Fisher river on November 14 and took the trail via Virdir and Ardal. This passes through better country than I had yet seen. The land is higher and the growth of grass good. A small town is starting at Ardal, being served by a branch railway line from Teulon. From Ardal I proceeded to Hnaua through a well-settled and prosperous community and eventually reached Gimli with the horses on November 18. My horses were in poor condition and, acting on instructions received, I arranged for their sale by auction at Winnipeg in the meantime feeding them well in the hope of realizing better prices.

I proceeded to Winnipeg and thence to Hudson Bay Junction to make arrangements for my winter's work. It was my intention to go to The Pas, but no trains were running north of Hudson Bay Junction owing to the line being blocked. I, therefore, returned to Winnipeg and thence to Gimli on December 1, where my assistants had arrived with my outfit from Fisher river. Having shipped this to Winnipeg for storage I left for Ottawa where I arrived December 7.



## APPENDIX No. 41.

## ABSTRACT OF THE REPORT OF E. W. ROBINSON, D.L.S.

SURVEY OF PART OF THE SECOND MERIDIAN AND PART OF THE FIFTEENTH BASE WEST OF  
THE PRINCIPAL MERIDIAN.

I left Ottawa on December 9, 1910 and arrived at Winnipeg on the 12th. I interviewed Messrs. Turnbull & Armstrong of the Hudson Bay railway as they had several survey parties working in the vicinity of The Pas and obtained from them some very valuable information. It was my original intention to use horses and toboggans for camp transportation and dog trains for bringing supplies from my base at The Pas to camp, but hearing that the muskegs were not yet frozen up owing to a heavy fall of snow early in the winter, I knew it would be impossible to use horses. I therefore decided to leave my horses in Winnipeg until such time as I could utilize them.

A discussion here of the relative cost and usefulness of the dog and horse for winter travel in the northland might possibly be of some help to other surveyors. Until recent years the horse was unknown in northern latitudes, the "husky" being employed exclusively for hauling. The husky probably originated by crossing the grey wolf with some domestic breed of dog, but it is now a distinct breed reproducing its kind with great fidelity. One has to go to the far north to obtain the real husky, all those in the valley of the Saskatchewan being mongrels. Owing to the demand for dogs in the last few years it is now somewhat difficult to obtain huskies or even mongrel huskies in any number, and one is compelled to resort to the domestic dog. Any of the larger varieties such as mastiff, Newfoundland, collie or shepherd make excellent toboggan dogs and with care will perform as much work as the mongrel husky. If trained carefully and this takes only a few days, they seem to enjoy hauling a heavy toboggan, in pleasing contrast to the husky who vents his displeasure in blood-curdling howls and fiendish snarls when being harnessed up. In fact the difficulty with most domestic dogs is to prevent them expending all their strength in the early part of the trip. If a stretch of exceptionally good trail is encountered they delight in tearing along at full gallop with a chorus of joyful barks. The first task of most Indian dog drivers with a train of huskies after harnessing them is to give each dog a severe thrashing with a loaded whip, with apparently the double object in view of impressing the dogs with a fear of their drivers and warming themselves up. Many writers of travels in the north have spoken of the cruelty with which these dogs are treated, and it certainly is heartrending to see, as I once did, a dog which after being worked until it dropped with exhaustion, unharnessed and with its eyes fast glazing in death, kicked off the trail with a curse. A toboggan train usually consists of four large dogs or five small ones, and the average load they can haul on a fairly good trail is four hundred pounds. The customary dog feed is fish, and dogs brought up on it seem to thrive well with an average daily ration of six pounds per dog. Contrary to what might be expected even in a country where the lakes abound with fish, it is not easy to procure enough for any number of dogs. Sometimes all the fish caught by the fishermen is contracted for by some dealer, in other cases owing to the migration of fish very few are caught, and Indians and half-breeds owing to their incurable laziness, rarely have enough for their own consumption. It is advisable therefore except on very long trips to take one's own dog feed.

Corn-meal and tallow and dog-biscuits are the substitutes and with domestic dogs are more suitable than fish for food. The corn-meal is first boiled for about



half an hour and the tallow then added, the ration being two pounds of corn-meal and one-quarter of a pound of tallow per dog per day. The dog-biscuits are put up in boxes of twenty-five pounds each and are fed without soaking, two pounds per day being a full ration. The price of fish varies but an average price is three and a half or four cents per pound for whitefish at the fishing station. Inferior varieties such as jackfish, goldeye and sucker are cheaper, say two cents per pound, but these are not fed to working dogs when whitefish, tullibee or sturgeon are procurable. The wholesale price of corn-meal in Winnipeg is about three cents per pound and dog tallow eight cents per pound and of dog-biscuit seven and one-half cents per pound. Feeding on fish will therefore cost per dog about twenty-two cents per day, on corn-meal and tallow eight cents per day and on dog-biscuit fifteen cents per day. All these prices are exclusive of freight or transportation. As one travels north, the price of fish drops very rapidly, and where one is beyond the point where it can be profitably shipped to market, it is by far the cheapest dog feed. The general experience is that it costs more than eight cents per day to feed on corn-meal and tallow owing to the quantity wasted and it has the additional disadvantage of requiring cooking. As it is difficult to get men at the end of a day's trip to spend the time to properly boil the corn-meal it is usually insufficiently cooked and in this state is quite unsuitable for dog feed. Biscuits are always ready to feed and if any are not eaten they can be gathered up.

Some of the varieties of dog-biscuit on the market are carefully made and containing as they do, meat scraps, tallow and ground bone, form a balanced dog ration. I used dog-biscuits during the whole winter and found them most satisfactory.

Most of the dogs I had were domestic and they took at once to the biscuit and thrived well. It takes a little while to accustom huskies to the use of corn-meal and tallow or biscuits and it is better to start feeding them some fish as well.

Portability is an all important item and a dog train using corn-meal or biscuit can haul enough to last them three times as long as if they were fed on fish. If however, fish can be obtained at intermediate points this advantage disappears.

Opinions differ as to the best dimensions for a dog toboggan. Undoubtedly a narrow toboggan has many advantages, but for survey work where so much of the outfit is bulky rather than heavy, I am of the opinion that a fairly wide toboggan, say sixteen to eighteen inches, is the most suitable. This enables one to keep the load low down.

If one decides to use horses it is better to select the ordinary cayuse or Indian pony rather than a heavier horse. Certainly on a good hard trail a heavy horse shows to advantage, but if the trail is bad and the feed poor and scarce a cayuse would live where a larger horse would die; and these conditions generally prevail on survey work. An average ration for a pony on this kind of work is fifteen pounds of hay and fifteen pounds of oats per day. As the cost of these vary so much it is not possible to give a general figure for the cost per day. The hay should be baled in sizes to fit the toboggans. Although an experienced man can bind a surprising quantity of loose hay on a toboggan, it saves both time and hay to have it baled.

A horse toboggan should be twenty-four inches wide and about sixteen feet long. If any hills have to be descended, shafts are absolutely necessary, but in flat country and particularly along a crooked trail simple traces on a whiffle-tree seem to be the most satisfactory. There is, however, considerable divergence of opinion on this point. On the average bush trail made by the surveyor a pony will haul from six to eight hundred pounds, and when it becomes packed and well frozen twelve hundred can be taken with ease. The ponies stand the cold fairly well provided one keeps them sheltered from the wind and well covered with, say, two thicknesses of blanket and a canvas cover. They are better unshod unless one has to cross lakes, or in the spring when the trails are sometimes icy. One man can look after one or even two horses



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each hauling from eight to twelve hundred pounds, whilst every dog train hauling from three to four hundred pounds must have a driver.

It is much easier to make trail for dogs than for horses. Two men can readily make in a day six to eight miles of trail for dogs through ordinary country, and if they use snowshoes and allow a day to elapse before travelling upon the trail, it will be hard enough to carry dogs without sinking. For horses a wider trail must be cut and it takes several trips with loaded toboggans and severe frost to make the trail hard enough to carry the horse without sinking. As one generally moves camp along a new trail, the progress is slow at the very time when rapidity is all important. Another point of importance is the crossing of a large lake or open place. After a few trips with the dogs across an open space the trail will be built-up, the light snow drifting in and each trip building it higher and higher until it is level with the surrounding snow. Subsequent winds cannot then block it up. With horse toboggans owing to the greater depth to which the toboggans sink and the plunging of the horses it is rarely possible to make a satisfactory trail across an open place and every trip a fresh trail has to be broken.

The surveyor has therefore many points to consider in making his decision as to which method of transportation to adopt—horses or dogs—and as the success of survey depends so largely on successful transportation, no trouble should be spared. In a few cases teams and sleighs can be used, but as surveyors are now being pushed farther into the northland and usually beyond any settlement, this is rarely the case, and the toboggan must be resorted to. Generally speaking if in a bush country, and if the trails made can be constantly used, horse transportation is cheaper than dogs, but in a partly open country and particularly on base line and meridian surveys, where one is constantly moving on, dogs will be found the most satisfactory. Even in the severest winters some rivers never freeze hard enough to carry horses while one can always find a place strong enough to carry dogs. Last winter some muskegs in the neighbourhood of The Pas did not freeze on account of the depth of snow and if I had used horses I should have been compelled to make wide detours with my trails. It might sometimes be advisable to use both horses and dogs; establish a main depot at some suitable point and have horses bring supplies there from the base of supplies and then use dogs for camp transportation or *vice versa*, the object being to avoid having to carry horse or dog feed farther than necessary.

I left Winnipeg on December 19, by the Canadian Northern railway with my outfit and men, arriving at The Pas on the afternoon of the 20th. I had previously sent my assistant there to make inquiries as to the available supply of dogs, and he reported that there were very few to be had, and those were small; also an exorbitant price was asked, viz., twenty to thirty dollars per head. Mr. E. N. Joyal offered to supply me with six dog trains complete and undertake my transportation, and this I accepted. A little time elapsed before he reported at camp with the dog trains but during the winter he performed his services with considerable satisfaction and relieved me of many details of transportation. I left The Pas on December 26, having been delayed there by the non-arrival of my freight. I travelled by team and sleigh to Birch river at which point I had to send the horses back owing to the unsafe condition of the ice. From here I moved across Birch river Indian reserve to my starting-point on the second meridian by means of hand toboggans, a slow and laborious task. Without much difficulty I found the iron post left on the south bank of Saskatchewan river. We passed little land of present agricultural value between The Pas and my starting-point. Along the river there is a strip of dry land from ten to forty chains wide, and also along Birch river one can find some dry land where tillable crops could be raised. The remainder of the country is of a swampy nature which would need draining on a wholesale plan to render it fit for agriculture. Hay can be cut around the edges of some of the marshes. It was reported to me that in some seasons of extreme high water the whole country is flooded. I did not have many opportunities



for examining the soil owing to the depth of snow, but in most cases I found a rich black muck which would prove very fertile if drained. North of Saskatchewan river along the second meridian the country continues to be swampy with willow and alder growing thereon. Tearing river which we crossed is a rapid stream carrying the waters of Cumberland and Namew lakes into the Saskatchewan. At certain times of the year this river provides excellent sturgeon fishing.

Arriving at the north boundary of township 56, I started the survey of the fifteenth base line eastward. In sections 34, 35 and 36 range 31, I crossed a belt of spruce and tamarack from four to six inches in diameter. This strip of timber stretches in a northwesterly direction and contains a considerable quantity suitable for pulp wood. Through range 30 the base line is in a marshy country drained by small sluggish creeks. To the north lies Barrier lake a shallow lake or more truly a marsh. Saskatchewan river was crossed in section 36 and along its banks is a dense growth of grey willow with black and white poplar up to twelve inches in places. Through range 29 the Saskatchewan was crossed twice, the country being still of a marshy nature with a rich black muck soil. On the south side of the Saskatchewan lies Saskeram lake. This is more truly a large marsh containing some small lakes connected by sluggish creeks. Several small islands exist covered with spruce, tamarack, poplar and birch up to ten inches. The main winter dog trail between The Pas and Cumberland House crosses this lake. The base line again crosses Saskatchewan river in section 33, range 27; the banks are covered with willow, alder and white and black poplar up to fourteen inches in places. At ten chains from the left bank of the river the line enters the south end of Reader lake which is shallow, about six miles across and six miles long. Stretching along the east bank of Reader lake is a rocky ridge covered with jackpine and scattered birch, spruce and tamarack up to twelve inches. All this ridge is included in Indian reserve No. 21. Small patches of good land exist and some of these are being utilized by the Indians as gardens. A wagon road starting from the north bank of the Saskatchewan opposite The Pas runs along this ridge as far as Atikameg lake. In the winter this road is used for bringing the fish down from Atikameg lake where they are caught in large quantities. Leaving this ridge the line enters a spruce and tamarack muskeg crossed by a few small ridges until in section 34, range 26, a prominent ridge about a mile in width is encountered covered with spruce, tamarack, jackpine and poplar up to six inches. Along this ridge is the located line of the Hudson Bay railway. To the east there is a large expanse of swamp and muskeg about twelve miles in width. Small lakes and some sluggish streams occur at intervals.

A growth of willow generally covers the country, with some small spruce and tamarack along some of the creeks. In ordinary seasons hay can be cut around some of the marshes. In section 36, range 24, there is a ridge from half a mile to one mile in width timbered with spruce, tamarack, poplar, birch and jackpine, averaging eight inches. This ridge has a general northwesterly and southeasterly trend and the timber is sound and would make good milling timber. On the east side of this ridge one again enters swamp and muskeg some ten miles across and of a similar nature to that on the west side of the ridge. On the east side of this swamp on the shore of Moose lake there is some high land. Here we found a small quantity of spruce, tamarack, poplar and jackpine up to six inches and the soil was a sandy loam with considerable rock. Moose lake is a deep water lake of large expanse and is one of the principal fishing grounds in this part of the country. Whitefish, jackfish and trout are caught in large numbers annually. I produced the line across a bay of this lake finishing on the east side of the first timbered point that projects from the south shore of the lake where it can be readily found when required.

I then commenced to move my camp and outfit back to the second meridian arriving there on March 3. My work at this time was somewhat delayed owing to the non-arrival of freight to be brought by the Canadian Northern railway to The Pas.



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We commenced work on the second meridian on March 6. The line passed through some willow swamp and then crossed the ridge along the south side of Belanger lake. This lake is deep and about two and one-half miles in length and two miles in width. The main winter trail from The Pas to Cumberland House crosses the northern end. North of the lake is some higher land carrying spruce, poplar, jackpine and tamarack up to ten inches with patches of brule. The soil is generally a sandy loam with considerable rock, but some strips of excellent clay loam soil were encountered. The country remains of this description until English narrows, a portion of Namew lake was reached. Namew lake which is connected by English narrows and Whitey narrows with Cumberland lake is deep and well stocked with trout, whitefish and jackfish of a large size. The second meridian runs through its entire length crossing some points projecting from the west side. The banks are generally well covered with spruce, tamarack, poplar and birch up to ten inches, some of it excellent milling timber. The northern shore of Namew lake was reached in section 24, township 61, and the land rose steadily from the lake shore. The timber increased in size until near the north boundary of section 36, township 61, where the spruce reached a diameter of thirty inches, with scattered birch, poplar, tamarack and jackpine up to twenty inches. The soil was a sandy loam with some surface rock. I reached the north boundary of township 61 on March 27, and decided to finish my season's operations here. There was every sign of an early spring, in fact the lakes were then covered with water. I reached The Pas on March 31, and paid off my party. This town, for some time a prominent Hudson Bay post, has made considerable strides during the last few years. It has a population now of about 400, and has five general stores, a doctor and a dentist, school, etc. A steel railway bridge across the Saskatchewan is now in course of construction to connect with the Hudson Bay railway at present being located. A branch line of the Canadian Northern railway enters the town and gives a semi-weekly train and mail service.

Owing to the lack of agricultural land in the immediate vicinity of The Pas, agriculture has not been carried on to any great extent. All the usual vegetables seem to thrive well and it is reported that they are not unduly troubled by summer frosts. Undoubtedly if the country were drained the climate would be considerably improved and I am of the opinion that it would make excellent wheat raising land. There is a considerable quantity of natural hay meadow, and consequently the raising of cultivated grass has not been necessary, but I was informed that timothy grows well.



## APPENDIX No. 42.

## ABSTRACT OF THE REPORT OF O. ROLFSON, D.L.S.

## SURVEYS IN THE BRAZEAU DISTRICT, SOUTHWESTERN ALBERTA.

We left Edmonton on May 3, 1910, and proceeded by rail as far as Wolf Creek. Thence we followed the wagon road to Whitemud and the pack-trail southerly to Brazeau river, arriving at our destination in township 44, range 20, west of the fifth meridian exactly one month after leaving Edmonton.

The trail followed crosses McLeod river about a mile above the mouth of Embarras river, which it, in turn, crosses four miles farther on. To the east of Embarras river, near Whitemud, it branches off, one branch following the east fork of the river to the Pacific Pass coal mines on the Pembina, and the other following the west fork to the Yellowhead Pass Coal and Coke company's mines. Following the latter branch of the trail, we proceeded from the mines southwesterly to McLeod river, and thence mostly along the river-bottom to the divide between the McLeod and the Little Brazeau. Reaching the Little Brazeau we followed it to a point near a camping ground known as the 'graveyard,' from which a day's travel brought us to our field of work.

As far south as the divide between Pembina and Embarras rivers, the country is gently rolling with jackpine on the higher lands, and spruce or tamarack muskegs on the lower lands; some fairly level areas, however, are covered with poplar. The water in the rivers and streams is fresh and good.

Near this divide and east of the 'graveyard,' on Little Brazeau river, the country on both sides of the river has been burned over and is now covered with dead timber, windfall and young jackpine. Farther south it is much higher and rougher, and timbered with pine, spruce, and some fine tamarack and balsam, up to twenty-four inches in diameter. There are many meadows, from five to forty acres in extent which provide splendid feed for horses.

South of Little Brazeau, the mountains rise high and rugged, the long ranges running northwesterly and southeasterly, with deep valleys between. The high peaks projecting above timber-line make the scenery beautiful. Rivers and streams are numerous, the larger ones having steep cut banks.

Coal seams were noted in the cut banks of Brazeau river in townships 43 and 44, range 20, but no other minerals were found.

The country south of Little Brazeau river is not suited to farming, but some parts might make good ranching land when cleared, as feed in the meadows and on some of the hillsides is good.

The air is always clear and the heat never oppressive, while the nights are cool and summer frosts are frequent. On the morning of August 25, there was ten inches of snow, but by noon of the following day it had all disappeared.

Game is abundant, consisting of sheep, goats, bears, deer and elk, rabbits, mink, ermine, &c., in the vicinity of Brazeau river. Partridges are numerous in the fall and mountain trout abound in the rivers.

Returning at the close of the season, the party followed the trail down the Little Brazeau from the 'graveyard' for a distance of about ten miles, mostly along the river-bottom and thence through a long muskeg valley and over a low divide to the Pembina. They then proceeded along the Pembina to the forks, and thence up the Little Pembina to the Pacific Pass coal mines. From here the trail led over a high divide and down into the valley of the Embarras and northerly to meet the trail from Whitemud.



## APPENDIX No. 43.

## REPORT OF JOSEPH E. ROSS, D.L.S.

SURVEYS IN THE KAMLOOPS DISTRICT, BRITISH COLUMBIA.

KAMLOOPS, B.C., December 17, 1910.

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa.

SIR,—I have the honour to submit the following report of my season's operations in the Kamloops district of the railway belt of British Columbia.

On April 8, I started from Kamloops for Monte creek and Ducks range, to define the north boundary of the Martin Mountain Forest reserve. The land to the north of this reserve has been all settled within the past few years and only a few of the poorest quarter sections remain unoccupied.

After completing this survey I moved to the Jamieson creek country, on the west of North Thompson river, to survey the sections immediately to the east of, and to locate the east boundary of, the Tranquille Forest reserve. This land is mostly open or openly wooded, and not very hilly. The soil is fairly good and if water were available for irrigation it would be well suited for farming. As it is, the extreme dryness has prevented the few settlers who have located here from meeting with success.

From here I moved to lac du Bois to begin the main work of the season, subdivisions in, and ties between the Tranquille, Copper creek, Criss creek and Deadman valleys. This was the largest continuous stretch of work I have had for some years, the work being usually composed of small scattered surveys.

The wagon road does not extend beyond lac du Bois so it was necessary to get a pack-train of six horses for transportation purposes. However there were generally good pack-trails throughout the country, and only on Criss creek was it necessary for us to clear out trails for our use.

The most promising farming land we saw during the season was in sections 1 and 11, township 22, range 20, west of the sixth meridian, on Tranquille river, where there is good soil, and water is available for irrigation. With the exception of this land, on which there are now three settlers, the Tranquille valley is narrow and rugged, with steep mountainsides 2,000 feet high and picturesque canyons. While the soil in the settled quarter sections is excellent and easily cleared, an occasional summer frost has each year killed the potatoes, and it seems very doubtful if the settlers will be able to raise them. At an elevation of 4,000 feet there is a plateau covered with dense bush, chiefly jackpine, and unsuitable for agricultural purposes.

The early advent of the Canadian Northern railway will be of great assistance to the settlers of Copper creek and Tranquille river if a siding is made at Copper creek. A road from there could be built at moderate cost up Copper creek and along the route of the present trail to Tranquille river.

After running ties to Copper creek and Kamloops lake from the Tranquille valley, I extended the survey up Copper creek and around the Red lake and Frog creek valley, in which there is no land suitable for settlement, on account of the dry climate and the impossibility of procuring water for irrigation. The land is suitable for grazing, and that is the best that can be said of it. One settler has located on a wild hay meadow in section 34, township 22, range 21, west of the sixth meridian.



A tie was run to the existing surveys on Deadman river, crossing a canyon on Criss creek and a high ridge between Criss and Deadman valleys.

The work was carried northward to Criss creek valley and another tie run to the end of the old surveys in Deadman valley.

In the northeast quarter of section 36, township 23, range 21, west of the sixth meridian, the valley of Criss creek becomes wide and partly open and for five miles to the north limit of the railway belt, there is a good strip of arable land in the brushy meadows along the creek. Just outside of the 'belt' there is a wild hay meadow, 100 acres in extent. While the land along Criss creek is good, and would be excellent agricultural land if situated at a lower altitude, its height, 4,000 feet, with prevalent summer frosts, renders it unsuitable for general farming. It may be a good valley for hay growing and oats may be raised but no test has yet been made. For years this valley has been used by stockmen of the district as a grazing ground. The boundary of the 'belt' was run from Criss creek to Deadman river, crossing a plateau wooded with jackpine.

A wagon road ascending the hill from Tobacco flats, on Deadman river, leads across this plateau to a settlement recently formed by some settlers on the upper Deadman river, in the provincial lands. A road has been built by the settlers from there to another settlement on the upper Bonaparte, where it connects with a government road leading to Seventy-mile House on the Cariboo road. The road from Tobacco flats is steep and rough, with rocks and side slopes that make travel difficult, and at times dangerous. We thought that we had found the worst road in British Columbia, but we were undeceived on finding a branch leading from this road to Snahooshe (Deadman) lake, on which there was a descent of twenty-five chains at an angle of twenty-four degrees, with a sharp curve in the middle to add interest. For this descent a sled is used, a wagon being too difficult and dangerous to handle.

Deadman river is in a steep, rugged canyon. The 'belt' boundary crosses the valley at the north end of Mowich lake, over a mile south of Snahooshe, or Deadman lake, where a company which owns the land at Walhachin (formerly Pennys) is building a big dam for the purpose of holding water in the lake. This company has spent a great deal of money procuring water for irrigating their property. From Deadman river, at the mouth of Criss creek they have built a large flume about eighteen miles in length, while they have also built flumes and ditches from Barnes creek. As a result of their efforts the old Penny ranch has become the thriving village of Walhachin, a prospective fruit centre, with a population composed almost entirely of English people starting orchards which should, in a few years, be very productive.

Having completed work in the Criss and Deadman valleys I moved to the Summer range, south of Savona, and ran a tie between the existing surveys on Guichon and Barnes creeks. The land here, 4,000 feet above sea-level, is very similar to that on all the plateaus, rolling, wooded country, with occasional hay meadows.

Having completed this work I sent the packhorses to Monte Creek to be wintered, and we went to Ashcroft, moving by train from there to Kamloops.

The remainder of the season was spent on subdivision surveys to the south of Kamloops in townships 17, 18 and 19, range 18, west of the sixth meridian. This land is about 4,000 feet above sea-level, rolling and broken and thickly wooded with jackpine. Each year sees some venturesome settler discovering an anticipated 'Mecca' in a wild hay meadow deeper in the jackpine forests than other settlers have penetrated. Thus the demand comes each year for an extension of the surveys in this district. After one attempt at raising a crop on the high meadows the majority of these hopeful settlers quit in disgust. On November 23, I completed the work in these townships and returned to Kamloops, closing field operations for the season.

The year was exceptionally fine and dry, only one day being lost on account of rain. The summer was too dry for the farmers and crops were poor throughout the district. In July and August the country was covered with a pall of smoke from



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several bush fires, but no great damage was done to timber, the flames keeping to the jackpine plateaus.

Tranquille and Deadman rivers and Criss creek are well stocked with small trout. Deer and bears are quite plentiful in the districts visited, while coyotes are everywhere present, making the night hideous with their yelping.

On Criss and Guichon creeks beaver have built long series of dams, flooding many small meadows. In no part of the year's itinerary were the beneficial results of the 'close season' so strikingly evident as on Guichon creek, where we were fortunate enough to see the animals at work. They are marvellously tame, and took very little notice of our presence. However the surveyor whose lines are continually striking ponds and dams, with dense willow, rising out of a couple of feet of water, is apt to consider the renaissance of the beaver a doubtful blessing.

The Summer range, between Savona and Guichon creeks is one of the foremost duck-hunting grounds in British Columbia. On the numerous lakes, ducks and geese abound in the fall. Red lake is a favourite breeding ground for ducks.

A surveyor's report from British Columbia is incomplete without some reference to the mosquito pest. This year we were fortunate enough to avoid it, being in country where the nights are cool, and stagnant water scarce. On Copper creek we encountered swarms of black-flies, and endured two weeks of misery.

Of the 230 days in the field there were thirty-three Sundays, one day was lost through bad weather, nineteen in moving camp, while the remaining 177 days were occupied in running 172 miles of line and marking corners.

Mining men have for many years had their eyes on the Tranquille. Near its mouth a gold dredge was tried unsuccessfully. At the 'forks,' that is the junction of Tranquille river and Watching creek, some placer mining was done in the early days, but the ground has long lain idle. There is undoubtedly free gold there but up to the present it has not been found in paying quantities. Some prospectors were on the river this summer, and we heard rumours of wealth untold, and saw glowing advertisements of the prospective value of shares offered for sale, but the rumours remain unconfirmed.

At Copper creek and Criss creek we ran across mining claims. At the former a company built a concentrator several years ago, and did considerable development work on cinnabar properties, but nothing is now done except assessment work.

Only a few years ago this Pacific province based its hopes of future greatness on its vast mineral wealth, but the pay-streaks of the past have dwindled to nothingness, and the few substantial mines that now operate are mostly of low grade ore. There have been many small booms, towns of rough buildings and tents rising with startling rapidity, only to fade away to the realms of unpleasant memory. British Columbia at last realizes that minerals are not her great asset, that the fertile soil of her valleys, her forests of giant trees and her salubrious climate are more reliable, and productive of greater wealth.

While the farmers were in bad luck this year on account of the exceptionally dry summer, other businesses thrived. Ashcroft, the outfitting point of the Cariboo district was very active. The points of the northern interior, Fort George, Cariboo and Nechaco districts import their supplies through here. From Ashcroft automobiles, stages and wagons leave daily with passengers and freight for Soda creek, the foot of navigation on the upper Fraser river, 165 miles distant. The great rush to the north during the past season threw life into this usually quiet town. Accommodation was scarce, but Ashcroft strove to fulfil its duty to the itinerant throng, and prospered.

Savona, too, was busier this year than it has been since the days of 'construction.' The lumber mill there worked steadily, supplying material for the buildings and flumes incidental to the development of Walhachin. It is probable that in the near future the flats of the Deadman Creek Indian reserve, between Savona and Walhachin, will be the site of the largest fruit raising colony in British Columbia.



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Kamloops increases in size from year to year, and now contains a population of nearly 3,800. The spirit of optimism is here deep rooted, the coming of new railways is looked for with great expectation and realty speculators are busy. There is a good fruit and agriculture area contiguous to the town and its winter climate is one of the best in the Dominion, so optimism is justified.

Three or four years ago the fact that the country is drying up began to grow apparent; ponds that were in existence two years ago are now dry, while the flow of water in the creeks is gradually diminishing. The heavy snow in the hills, upon which the water supply of the district is dependent does not come as it used to. Unless a change comes soon and the snow falls deeper in the hills the district will be face to face with a serious problem.

In conclusion I wish to state that throughout the season the work progressed smoothly and there was very little time lost. Both the weather and the country in which we were working were favourable to progress.

I have the honour to be, Sir,

Your obedient servant,

JOS. E. ROSS, D.L.S.



## APPENDIX No. 44.

## ABSTRACT OF THE REPORT OF A. SAINT CYR, D.L.S.

SURVEY OF PART OF THE THIRD MERIDIAN AND PART OF THE SEVENTEENTH BASE  
WEST OF THE THIRD MERIDIAN.

During the winter six tons of supplies were forwarded with a great deal of difficulty to the north shore of Crean lake. We left Prince Albert May 3, and reached the third meridian on May 12. The line was produced from township 60 to the seventeenth base line, which was then projected westerly across ranges one to twelve inclusive.

East of the third meridian the country is rolling with a descent towards Montreal lake which is about six or eight miles distant. The soil is stony and in many places the surface is covered with windfall. Some large areas of poplar and birch, up to ten inches in diameter, were seen near the meridian but in the vicinity of Montreal lake the timber is small and scrubby. The western shore of the lake is low and swampy.

In township 61 the soil is light but improves towards the north; large boulders, however, are numerous. There is a little hay land and feed was scarce.

In townships 61 and 62 there are several lakes which abound with fish. They are drained by a small stream which flows through a narrow valley, between steep hills as far as its junction with Crean creek. From here to Montreal lake the valley becomes a series of flats, often swampy and covered with dense willow or coarse hay. The stream is navigable only a short distance beyond the third meridian.

Just south of the north boundary of township 60, a belt of spruce, eight to twenty inches, extends east to the stream above mentioned, and west across ranges 1 and 2. This area has never been burned over though fires have swept the district immediately to the north.

North of township 60, the country is hilly and this is followed by several miles of almost level surface, covered with scrub poplar, birch and jackpine.

Wehakwao (Swearing) lake is situated in townships 63 and 64, and is bordered by impassable bogs. The lake which is shallow and well stocked with whitefish and pike, covers an area of about twenty-five square miles and the distance between the opposite shores along the meridian is six miles. Two streams enter the lake from the west while the outlet is from the east shore southeasterly to Montreal lake.

West of the meridian the seventeenth base line crosses several miles of undulating land, alternating with burnt-over areas of willow, dense jackpine or tamarack swamp. A prominent landmark called 'Thunder hill' by the Indians, lies about two miles north of the base line in range 2. Its base is surrounded by muskegs which drain into a lake on the line in the same range. North of the hill are some hay meadows followed by stony land with little vegetation.

The north of township 65 is hilly with the tops of the hills covered with clumps of jackpine and poplar of large size. These blocks of timber taken together cover about half a square mile and average 22,000 feet B.M. to the acre.

In range 4, the country is partly open along the line and the land, being high and rolling, is suitable for grazing. Grass grows in profusion and there are many creeks of fresh water. In range 5, the soil is lighter. Many tamarack swamps occur in township 63, with trees from six to eighteen inches. North of the base line the country is rolling or hilly and dotted with lakes.



Smoothstone lake lies in range 6. It extends from a mile south to about eleven miles north of the line, and has an area of ninety-five square miles. An island occurs in this lake with an area of nearly three square miles. This island is covered with poplar and spruce suitable for pulp-wood.

West of Smoothstone lake the country is undulating. A block of timber estimated to contain seven million feet B.M., stands about one mile and a half west of the shore and another block along the shore will give seven hundred and twenty thousand feet, B.M.

A lake covers about two-thirds of township 64, range 8. This lake is shallow and drains through a creek into Sled lake in township 63, ranges 9 and 10. The lake lies in the centre of a low and boggy district, the northern extremity of 'caribou muskeg' which extends south to township 60.

High hills wooded with poplar, birch, jackpine, fir and spruce, rise in ranges 8 and 9, about two miles north of the base line. These hills extend north of Dore lake. Their southern slopes will produce two million feet of lumber.

On the north shore of Sled lake about six miles south of the base line some half-breeds took up land twelve years ago. They have comfortable houses and on the land they have cleared they grow all the ordinary vegetables, and some have raised oats and barley. The soil is a clay loam free from stones. They also own horses and cattle for which they procure feed from the hay meadows around the lake in township 64, range 8.

Good land was again seen in range 12, near Beaver river. Benches heavily timbered with large poplar and birch extend from eight miles south of the base line to three miles north of it. Beaver river is one hundred yards wide where it crosses the base line. This river is the only one in the country explored which is suitable for driving logs.

Moose, caribou and red deer roam at will in these districts and bears are quite common. I was frequently warned by the natives to beware of timber-wolves. Their tracks were frequently seen. The fur-bearing animals are coyotes, foxes, otter, mink and lynx. Prairie-chickens, partridges and ptarmigan were also seen.

The best varieties of fish caught are whitefish, tullibee, pickerel and pike. Carp are also plentiful.

Hay, which I ordered to be put up during the summer near Sled lake, was not available at all; the hay in the vicinity had been retained by the Isle a la Crosse Fish company, and oats which I had ordered to be forwarded to Green lake had not been delivered. We were consequently forced to break camp on December 20. We returned to Green lake and travelled from there to Big river and thence to Prince Albert.

I returned to the third meridian later and made a tie survey to Montreal lake.



## APPENDIX No. 45.

## ABSTRACT OF THE REPORT OF B. J. SAUNDERS, D.L.S.

## SURVEY OF PART OF THE NINETEENTH BASE LINE, WEST OF THE FOURTH MERIDIAN.

For this survey my supplies were sent in from Edmonton to Lloydminster via the Canadian Northern railway and thence by horse teams to a point about fifteen miles beyond the north end of Primrose lake, where a permanent cache was built. This work was done in February and March. From the cache a small portion of the supplies were pushed on by dog teams ten miles farther north to a point near the intersection of the base line with the fourth meridian, but this work had to be discontinued owing to the snow going off suddenly and early. It was important and necessary to get these supplies in at this time of the year as the country for about twenty-five or thirty miles south of the base is practically one mass of muskeg and nearly impassable in summer-time even for the packhorses. Two men were left in charge of the supplies to protect them from being looted and from fires, and at the same time to do some work in trail making between the cache and the line.

In June, I set to work to organize my party and get everything ready. Owing to the great demand for labour throughout the West last year in railroad construction and other work, I found great difficulty in engaging suitable men for the survey and had to take a number of inexperienced men, many of whom were comparatively new arrivals in Canada. Packhorses for use on the work beyond Cold lake were purchased in Calgary and brought up by rail to Edmonton and on July 12, a start was finally made.

The route taken from Edmonton was by trail via Fort Saskatchewan, Bruederheim, Wostok, Whitford Lake, Saddle Lake, St. Paul de Metis and Cold Lake Indian reserve to Beaver river where a day was spent getting everything ferried across. I was able to take teams and wagons loaded with additional supplies as far as the eighteenth base line to supplement what had been taken in during the winter. The packhorses were loaded lightly so as to save them for the actual work beyond the end of the wagon road. From the eighteenth base we travelled practically over the same trail which had been used by Mr. Wallace when surveying the fourth meridian in 1909. After about one week's tedious work, camp was pitched on a widening of Calder river near the beginning of the line, this being the only place where there was any semblance of grass for our horses. In six weeks time we had run only about eleven miles of line, so much time being required making and repairing trails to enable our horses to get along. It is no exaggeration to say that as many miles of corduroying were necessary in trail making, as there were miles of line run.

There being practically no feed for the horses along or close to the line, I concluded that the only thing to be done to push the survey along was to endeavour to get the line ahead to the Lac la Biche-McMurray dog trail, and to take in supplies by this route if possible. Reports were current that plenty of hay could be put up in the vicinity of Whitewood lake, which the line would probably intersect, or run close to in range 7 or 8. These reports I found to my sorrow to be misleading and untrue. Having returned to Edmonton in October for more supplies, I made the attempt to meet my men, or some of them, as definitely arranged before leaving camp, at Whitewood lake, but this proved unsuccessful after a most arduous trial in which two or three of my men, as well as myself, nearly perished by drowning and freezing. On New Year's day I returned to Lac la Biche and went in again via St. Paul and



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Cold lake and met my party coming out. Of the twenty horses left with them, only one was alive, the others having succumbed to the cold, starvation, and attacks of wolves.

The section of the country traversed by the nineteenth base line up to range 6, lies practically on the watershed of streams flowing easterly, southerly and northerly, and in consequence there are no streams of any size met with. Small muskeg lakes are quite numerous and muskeg is met with everywhere.

The timber consists of small spruce, tamarack and pitch-pine; only an occasional poplar was seen. Fires have no doubt swept the country periodically and as a result, the timber is small and scrubby and quite unfit for commercial purposes.

Where there is any soil it is poor, and in my opinion unsuitable for agricultural purposes.

Moose and caribou are very plentiful, as are also timber-wolves.

The weather was extremely cold in December and January, quite the severest I have ever experienced and snow lay three feet deep on the level.

Should it be decided to continue the survey of this line, it would be best to take in supplies via Lac la Biche in winter and cache them at points where the line would intersect the two dog trails leading from Lac la Biche to McMurray, and a trail running from Owl river to House river. Necessary supplies, if horses are used on the survey, should include plenty of hay and oats.



## APPENDIX No. 46.

## ABSTRACT OF THE REPORT OF W. A. SCOTT, D.L.S.

## MISCELLANEOUS SURVEYS IN SOUTHERN ALBERTA AND SASKATCHEWAN.

Upon receipt of instructions I left Pincher Creek on May 7, and on the 14th arrived at our first work in township 9, range 30, west of the fourth meridian.

On the completion of the work in connection with the Peigan timber limit in township 9, the party moved to township 10, and enclosed the block composed of sections 1 and 12. The work so far was in the Porcupine hills, a range 1,500 feet above the level of the prairie to the east. The summit runs almost due north and south slightly to the east of the fifth meridian. The hills are timbered with fir up to four and a half feet in diameter. On the whole, the east and south slopes of the ridges may be said to be bare or covered with small poplar, and the creeks in the valleys contain many open patches. The soil is a rich black loam with a light subsoil but owing to the hilly, wooded nature of the country and to frequent summer frosts, it is not suited for farming. It does however afford an excellent opportunity for ranching. There is much merchantable timber left in the hills although a great deal of the best of it has already been taken out. No difficulty is experienced in reaching almost any part of the Porcupine hills by wagon road, as there is one crossing the summit from east to west every few miles.

Our next work was the subdivision of part of township 11, range 2, west of the fifth meridian, which is easily reached by a good wagon road. The country here is very similar to that in the Porcupine hills but there is little heavy timber except on the tops of the ridges where there are a few scattered fir; the remaining timber is small poplar and willow. The valleys are open and afford good grazing for stock. Very little effort is here made to raise a large quantity of grain, the time of the people in this vicinity being devoted to the raising of stock.

On the completion of this work the party moved, on June 11, to the third base line to connect up three miles which crosses the summit of the Livingstone range. This was a rather difficult piece of work and as it could not be completed from one end, necessitated a two days' move, by wagon and pack-train, around through the Crowsnest pass to the other end of the three miles. The Livingstone range here is 2,500 feet above the level of the land to the east and marks the dividing line between hilly prairie to the east and a rough mountainous country to the west. The easterly slope of the range is more precipitous than the westerly slope.

We moved to township 10, range 4, going by a wagon road to the 'Gap' in the Livingstone range, thence up the valley of Racehorse creek four miles by wagon over a trail cut by ourselves, and the remaining distance of two miles, by pack-train. The atmosphere soon began to become very smoky on account of forest fires to the south. When the work for which I had instructions in this township was completed I considered it advisable to move camp to some point where the party could be moved from all danger of the fire in a short time, as the fire from the south had reached a point only six miles south of our camp, and there was a forest fire in township 12, range 4, to the north of us, which at that time was under control but which at any time might break out again. Two men from my party were assisting the Dominion Forest Fire Ranger at the northerly fire. I accordingly, on July 21, moved camp to the 'Gap' and completed the traverse of the North Fork of Oldman river. This traverse took three days and from the completion of the traverse until August 6, the entire party



were fighting forest fires under the supervision of Dominion Forest Fire Ranger, Mr. Hart. At one time only, was any danger encountered when, due to a heavy wind and big timber, the fire suddenly increased in violence and camp had to be moved from the 'Gap' to a point of safety several miles east, outside of the Livingstone range. In this case the outfit was started only fifteen minutes in advance of the fire on account of having some difficulty in finding the horses which were two or three miles from camp. Various methods of fighting the forest fires were employed, but during the day when the wind freshened it was impossible to do anything.

On the evening of August 5, the rain started and continued all the following day; this effectually put an end to the fires. I considered it advisable to work outside of the mountains until such time as the grass in the burned area would have grown sufficiently to afford feed for the horses, so on August 8, I moved camp to township 10, range 1. The eastern half of this township is in the Porcupine hills and much of this part is covered with timber, poplar on the lower and fir on the higher hills. The western half is rolling prairie and is suitable for farming purposes, while the eastern half is suitable only for the grazing of stock. This township is readily accessible by good wagon roads.

On September 5, we moved back to township 12, range 4. Owing to a two days' snowstorm on the 6th and 7th work was not commenced until the 9th. It was found that the grass had grown sufficiently to afford feed for the horses but baled hay had to be supplied to the picket horse. Owing to the fire the production of lines was made easier than formerly as all underbush had been burned up, as well as the fallen timber of previous fires, which was so dense in this part. The timber previous to the fire was on the whole a dense growth of small second-growth jackpine. The westerly boundary of the burned area may be roughly said to be one mile east of the east boundary of range 5, and the northerly boundary one mile north of the fourth base line. The best timber in this section is in range 5. A fire in the mountains is a more serious setback to the country than a similar fire in a flat country. Where the fire burned furiously up hill or was fanned by a heavy breeze, everything was consumed. There is at best but little soil covering the rock and stones and this was entirely consumed, leaving nothing in these parts but dead charred poles still standing in their bed of stones, gravel, and ashes. Under these conditions it may be many years before vegetation will again obtain a hold on these hills.

There is a good wagon road from Cowley or Lundbreck as far as the 'Gap'; here a bridge was burned out which makes the passage of a heavy load impossible without 'doubling up'. From the 'Gap' a wagon road follows the valley of the North Fork as far as section 11, township 12, range 3. Another wagon road branches from this road at the mouth of the northwest branch and follows the valley of this stream as far as section 9, township 12, range 4, at which point the deserted camp of the Great West Coal company is situated. There are numerous old Indian pack-trails following up the valley of almost every creek but they are only passable for an Indian and require to be cut out if they are to be used to any extent.

The general direction of all the ridges is north and south coinciding with the strike of the rocks. The tops of the ridges are usually bare rock of either grey or black shale, or a hard cherty conglomerate. The Livingstone range is an exception to this rule consisting of limestone or grey shale with limestone greatly in predominance. There is a large amount of coal in the hills, it being found immediately beneath the conglomerate. The dip of the rocks is towards the west and varies from 30 to 60 degrees. Outcrops of coal may be seen at the tops of most of the hills.

No doubt in the near future these coal areas will be made accessible by a railway.

The fall in the rivers I have estimated to be about fifty feet to the mile. Such a fall as this, combined with the nature of the country affords an unexcelled opportunity for the development of water-power.



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The work in township 11, range 4, was complete and work in township 12 in the same range was commenced. This was proceeded with until the end of October when I considered it advisable to bring in the party and start on miscellaneous correction surveys in Saskatchewan. The party was paid off in Pincher Creek on November 1.

After surveying the east boundaries of sections 29 and 32, township 13, range 2, west of the fifth meridian, I and my assistant took the train for Swift Current, Saskatchewan on November 11.

Work was commenced in township 16, range 13, west of the third meridian on November 14. I retraced the east boundaries of sections 3, 10, 15, 22, 27 and 34 and the north boundaries of sections 10 and 11 and reported that a resurvey of the entire township would be advisable.

I left Swift Current on November 19 for Froude and arrived there on the 21st. I drove to township 7, range 10, west of the second meridian and after chaining twelve miles of meridians, I reported that a resurvey of the entire township was necessary. On November 24, I left Froude and took the train for Zealandia arriving there on the following day. I drove to township 28, range 12, west of the third meridian and completed the subdivision of this township, establishing a new northerly boundary of Lake No. 1.

I left Zealandia for Quinton on December 1, arriving there the following day and drove to township 27, range 17, west of the second meridian to investigate the boundary of Mission lake in ranges 17 and 18. I found that the boundary was not shown correctly on the township map and I made a traverse of this lake. I returned to Quinton on December 7, and as the ground was covered with snow to a depth of eighteen inches I did not consider it advisable to continue work. I accordingly disbanded the party and left for home arriving at Galt on December 10.



## APPENDIX No. 47.

## ABSTRACT OF THE REPORT OF H. W. SELBY, D.L.S.

## MISCELLANEOUS SURVEYS AT ATHABASKA LANDING AND McMURRAY.

The subdivision of lots at Athabaska Landing was completed on May 12. The surface of the part subdivided was timbered and the survey required more cutting than I had anticipated. The land is rough and stony, and the soil sandy and gravelly so that nothing but vegetables could be grown on it.

The weather during the survey was fine but bush fires in the vicinity rendered the atmosphere so smoky that it was difficult to secure an observation for azimuth.

On May 21, I left Athabaska Landing for McMurray where I made some settlement surveys. My party had gone on, May 16, by the regular Hudson's Bay company's transport, but I was detained by illness until the next transport left on May 21. I reached McMurray on June 8 and my assistant, who with the party arrived a few days before, had established camp and traversed a part of the shores of Athabaska and McMurray rivers. He had plotted the information gained so that when the Minister of the Interior arrived on the 9th the plan was of very material assistance in determining what surveys were to be performed.

The old Hudson's Bay company's fort, now abandoned except for a short period in winter, is picturesquely situated on a bench overlooking Athabaska river towards the north, and at the base of a range of hills 200 feet high. These hills are composed mainly of a substance known as tar sands overlying limestone and covered by a thick layer of clay soil. The surface is heavily covered with poplar and scattered spruce with much underbrush and vegetation. The flat on which the fort is situated extends southeasterly from the main river along the foot of the hills above described for a distance of two miles, where it is cut by Hanging Horse creek and McMurray river. It has a width of about three-quarters of a mile. The greater part is covered with a thick growth of poplar and willow, but there are several prairie openings caused no doubt by fire cleaning up the land from which the timber for the use of the fort and other houses which have been occupied from time to time had been cut. It is only some twenty years since the Hudson's Bay company began bringing their supplies for the north from Edmonton and down the Athabaska river. Formerly these were brought down from Winnipeg via the Saskatchewan and McMurray rivers. One can imagine that the large number of boats needed to carry these supplies in one trip over the many portages met with by that route, would require also a large crew of men, who, having reached the end of their troubles, would probably camp at McMurray, resting for several days, before starting on their long return trip up stream perhaps leaving large camp fires to spread. This, I say, going on for many years might account for the prairie openings found here and on the island but nowhere else for many miles around. Athabaska and McMurray rivers have cut a channel which leaves an island between the main branch of Athabaska river and the confluence of the other branch with the McMurray, and this channel, through which at high stages of water part of McMurray river discharges, forms the easterly boundary of this flat. Very little attempt has been made to grow any grain except in the vicinity of the fort and on the island. Wheat, oats and barley, besides all kinds of vegetables have been grown on the island, for at least thirty five years, and, I am told, without being damaged by frost. Upon this flat of land I found seventeen squatters. Having laid down on paper the area claimed by these squatters, I divided it into



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twenty-four lots and apportioned to each squatter his improvements and as much of the land as the lot lines would permit without encroaching upon the improvements of his neighbour. With the exception of about half a dozen who have been living here for some years and have habitable houses, and fenced gardens, these squatters have made very little attempt to improve their land. I think, probably, the cause for this was that until a survey was made, no one wished to improve a piece of ground he was not likely to get. Since the survey was made two have begun breaking and several are arranging to build better houses, and are sending for horses and implements to make improvements with. There is very little use for much grain growing until railroad transportation is established. As the quantity required is at present so small one ten-acre field would supply more than could be disposed of. It may be thought that the finding of petroleum, the mining of salt, tar sands, limestone and coal, together with the prospect of iron and copper in the vicinity, would encourage the development of the agricultural areas. This no doubt would be the case, but there is not the least chance for any of those industries being carried on until the facilities for importing machinery and supplies and exporting the minerals are improved to a great extent.

There is another feature that will influence the settlement of the country and that is the enormous areas of pulp-wood which are tributary to Athabaska river and which cannot be taken up-stream. This would be manufactured at some point either here or farther down the river where power could be readily developed. East of the mouth of Hanging Stone creek, along the banks of McMurray river, there is a flat from half a mile to a mile wide, heavily timbered with poplar and spruce,

At the request of those occupying lands on the base line, I laid out a road ninety-nine feet wide through the settlement which they desired in anticipation of the building up of a town of some importance should a railway be built into the settlement.



## APPENDIX No. 48.

## ABSTRACT OF THE REPORT OF D. A. SMITH, D.L.S.

## SURVEYS IN THE RAILWAY BELT, BRITISH COLUMBIA.

We left Kamloops on May 29, 1910, and reached our first work which was in township 25, range 8, west of the sixth meridian, on the 31st.

The land surveyed in this district all lies within a few miles of Shuswap lake and is easily reached by boat from Sicamous. Launches and steamers run on Shuswap lake and will land passengers or freight wherever desired. Violent and sudden storms, however, render travelling by small craft dangerous.

Hunakwa lake is reached by portage from the head of Anstey Arm. The portage is about a mile long with good firm ground and very little climbing. In high water a small boat may be taken up Hunakwa creek but during the time of survey June, there was not enough water to float an empty canoe.

The survey was commenced from the northeast corner of section 27, township 25, range 8, a point established by Mr. J. E. Ross, D.L.S., and was carried by triangulation across to the east side of Seymour Arm, where all the work lay. From Seymour Arm the survey was carried as far east as was expedient and the remainder of the work in that district was completed from Anstey Arm and Hunakwa lake.

During the early part of the work and from the latter part of September to the middle of November, when we left Shuswap lake, there was scarcely a day without rain and frequently the rain lasted all day. The thick underbrush was always wet so that it was almost as disagreeable on a fine day as on a rainy one. During July, August and the early part of September, the weather was exceptionally good. Considerable time was necessarily lost in going to and from work, since much of the land surveyed lay at some distance from the shore, and owing to the rugged nature of the country it was a slow and difficult undertaking to pack a camp outfit to a convenient place.

The land rises generally from the shore of Shuswap lake from two to eight hundred feet, with steep rocky slopes of which very little is suited for agriculture. Back of this there is generally a gently rolling bench or series of benches extending to the foot of the mountains. At the north end of Anstey Arm is a level tract of land about a mile in width extending to Hunakwa lake; this lake is about three miles long and half a mile wide. There are numerous small creeks, Anstey creek being the largest. During high water it may be used for bringing down logs, and from its rapids and falls considerable power might be developed.

By far the most valuable of the resources is the lumber though much of this part has been swept by fires in recent years. Most of the valuable timber has already been disposed of, and, outside of the timber berths, the good timber is scattered and difficult to get out. No minerals of value have been discovered, but the country has not been thoroughly prospected. Fish are plentiful but they are more of a sporting than a financial asset. Game is scarce, a bear, a deer and a few grouse being all that were seen in the district though signs of bears and deer were frequently noticed.

So far no attempts at cultivation have been made with the exception of small gardens, indifferently cared for, but the results, considering the work done, were promising. A few miles to the north, the common varieties of garden produce have been tried with excellent results. At the head of Seymour Arm a large tract of land is being planted with fruit trees, but what success will attend this industry remains



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to be seen. Early frosts especially on the higher levels, is the greatest danger that threatens them. Irrigation is not considered necessary, and, judging from the past season, the rainfall is sufficient for all purposes. Small wild fruit grows abundantly wherever a chance is afforded and there is no doubt that all small fruits would yield well. The swamp land can be drained and used for grain, hay and garden produce.

The quality of the land is very variable. There is a great deal of land in the territory surveyed that is useless from an agricultural standpoint largely on account of the rock and steep slopes, but it was necessary to survey it to take in what was good. The prevailing soil is a sandy loam with a gravel or gravelly loam subsoil. The swamps are generally of rich black loam, at present wet but easily drained.

On the completion of the work in the Shuswap district I moved to township 25, range 20, west of the fifth meridian about fifteen miles southeast from Golden. This part is easily reached by a wagon road following up the Columbia valley from Golden to Fort Steele. The Kootenay Central railway is graded out about fifteen miles from Golden but only about a mile of track has been laid yet.

During the time we were working in this district, the trees were heavily laden with snow. This, with from one to two feet of snow on the ground made fair progress impossible. Most of the work lay on the bench land where there is a thick growth of trees, the more open land in the bottom having been previously surveyed. The snow in the bottom was about six or seven inches deep.

The land rises from the river-flat with a very gentle slope which extends back varying distances to the foot of the steep slope leading to the upper bench land. Most of this lower land is good and has already been taken up. The upper bench extends in a gentle slope or a series of benches to the steep rocky sides of the mountains. The steep slope leading from the lower to the upper bench land is useless for agricultural purposes. So far as soil is concerned much of the upper land is good. It is generally clay loam, sometimes with sandy or gravelly subsoil, and is suitable for grain or fruit.

In this township, there is some good timber, chiefly fir, but here as in the Shuswap district the best has been disposed of and what remains is very difficult to get out. No mineral discoveries have been made, at least no mines are at present being worked.

The township is intersected by numerous small creeks some of which are being used to irrigate the lower land and small areas of the upper land. Irrigation will have to depend almost entirely on the rainfall which I believe is not sufficient for requirements.

In the settled parts, a number of apple trees have been planted, but have not given satisfactory results, many of them having died. The apples that I saw, which were grown in the district, were small but of good quality. It is doubtful if the upper benches will be suitable for fruit owing to the early frosts. Small fruits of all kinds give very large returns and are easily grown. From experience it would seem that on these, rather than on apples, the settlers will have to depend. Alfalfa has been grown and yields well.

Game is scarce, nothing but grouse being seen, though brown bears and grizzlies, deer, sheep and goats are reported to be fairly plentiful on the higher lands. Nearly all fur-bearing animals are becoming scarce in the railway belt.



## APPENDIX No. 49.

## ABSTRACT OF THE REPORT OF L. D. N. STEWART, D.L.S.

## SURVEYS IN THE KAMLOOPS DISTRICT IN THE RAILWAY BELT, BRITISH COLUMBIA.

After organizing my party at Kamloops we left on May 27 for township 23, range 9, west of the sixth meridian on the north shore of Shuswap lake. The land in this township rises somewhat abruptly from the lake except at the mouth of Ross creek where there is a flat of seven or eight hundred acres in sections 17 and 18.

The land in townships 22 and 23, ranges 9 and 10, where I worked is well adapted to fruit growing and mixed farming, being a sandy loam with a clay and gravelly subsoil. Several settlers are located on this part of the lake and some have orchards bearing fruit equal in quality to that of the Okanagan district. The climate is excellent being very similar to that of the Niagara peninsula of Ontario. There is plenty of rain in June; August and September are dry, while October, November and December are wet. There was a slight frost one night about the middle of August but this is unusual.

The water is excellent in both Shuswap lake and the tributaries, but the small streams usually become dry in August.

Shuswap lake abounds with fish of several varieties, the principal being grey, rainbow, dolly-varden and silver trout, while in autumn the salmon run up from the sea, frequently in immense quantities. Brook-trout are found in Ross creek.

Grouse are plentiful in the district and wild ducks are found on Shuswap lake in the fall. Black-tailed deer are plentiful and caribou are found on the higher elevations.

Shuswap lake seldom freezes over and steamers run all winter. During the winter of 1910-11 there was a tri-weekly service from Sicamous to the head of Seymour arm.

There is a wagon road from Notch Hill to Archie Redman's on section 30, township 22, range 10, which could be continued at a small cost around the south shore of the lake. There is also a wagon road on the north side of the lake extending the greater part of the way across township 23, range 10.

The land around the lake is well timbered, but in some places it has been more or less cut for lumber purposes, and there are frequent evidences of forest fires. In these cases thick second-growth is springing up.



## APPENDIX No. 50.

## ABSTRACT OF THE REPORT OF P. B. STREET, D.L.S.

## SURVEYS IN THE RAILWAY BELT, BRITISH COLUMBIA.

On June 12, we left Sicamous Junction up Shuswap lake to Cinnemousun narrows through which we passed and proceeded northerly up Seymour arm. This lake is very treacherous and dangerous as it is subject to sudden and violent storms. The country at the head of Seymour arm is rather rough and for the most part covered with timber. Township 26, range 7, west of the sixth meridian, in which my first work was situated, is made fractional by the boundary line of the railway belt which divides the Dominion and Provincial lands. Practically all this township lies on the east side of Seymour arm. The surface is broken by a series of ridges and valleys running northerly and southerly for the most part, the mountain range to the east also following a northerly and southerly direction. The northerly portion of Hunakwa lake lies in section 4 of this township; this lake is fed by creeks to the north and east, and empties into Anstey arm to the south. A well-cut pack-trail runs southwesterly from the head of Seymour arm to Hunakwa lake. Along the lake shore the timber is fairly open and easy to walk through, but farther back there is a great deal of second-growth cedar and hemlock, which is so dense in places that it is almost impossible to force a passage. The greater part of the south half of this township is rather dry and stony, but irrigation might be successful as two lakes of considerable depth occur in sections 5 and 6. The best timber in this township has long since been logged off or burned, the only timber of any value being some cedar in the southeast quarter of section 17, and a very few scattered white pine and fir in the other sections. Very little marsh or hay land is found in this township, but a small patch in section 16 and another patch in section 21 produce some slough hay of fair value.

None of the settlers in this township have been there long enough to have fruit trees which are producing, but the trees that I saw seemed to be doing well. There are patches of nearly level land varying from five to fifty acres which would be suitable for fruit farming, especially small fruits, and if irrigation can be resorted to, probably fifty per cent of this township can be successfully cultivated. The soil varies from a light sandy loam on the ridges to a heavy clay on some of the flat lands, but this clay does not occur extensively. One settler in section 16 showed me some good vegetables grown without irrigation. In sections 7 and 8, where there was once a logging camp, timothy and clover were growing most luxuriantly, which suggests that the ridges unsuitable for fruit or root crops might make very good pasture.

Rain fell freely during June and July, but August was rather dry and very warm. The lake rises until the first week of July and then commences to fall, the water falling rapidly in August. No minerals were found in this township, although small pieces of rock containing good mica samples can be found almost everywhere. About twelve miles north of here there are a great number of claims staked out, and some very good samples of silver and lead ores are brought down every week. The old pack-trail to the 'Big Bend' country starts at the head of this arm and the provincial government are building another road up to the mining claims.

There seems to be no game in this district, as none of our party saw any grouse, ducks, rabbits or larger game during the ten weeks we were in the district. Some very good trout can be caught at certain seasons of the year, and the annual salmon run provides the settlers with their winter supply of fish, the salmon being easily speared in the shallow water, and either salted or smoked for future use.



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On completing this work I moved across the arm into township 26, range 8. The Arrow Lakes Lumber company have their offices and supply post here on Celista creek, and have four camps up the creek. This township is also fractional and is still partly held under timber berth. Some excellent land is found here, and Celista creek would make irrigation very easy. In section 2 there is land almost entirely cleared, consisting of good rich clay loam. There is considerable timber left in this township yet, but it is mostly hemlock. Some birch, for which there was a good demand last summer, when cut into cord-wood, grows on the ridges. The Arrow Lakes Lumber company have a large stern-wheel steamer which makes occasional trips up to this camp, and which will carry and deliver any freight for the settlers. The Fruitlands company are going to build a small steamer to run from Sicamous Junction to their property, for the benefit of the settlers. This company built a hotel and a store and succeeded in getting a post-office, 'Seymour Arm,' started this summer. They have about twenty settlers on the lands now. Considerable water-power could be developed along Celista creek, there being a series of falls just inside the railway belt. There is also considerable water-power on Seymour river, but this will probably be utilized when mining operations begin. On completing the work here I received instructions to proceed with the survey of agricultural lands in township 22, range 1, west of the sixth meridian and accordingly moved my party to Revelstoke. I sent my assistant, who had arrived just before the completion of the work on the lake, down to Greenslide with the party and outfit, and took my rowboat and a load of provisions down Columbia river to the camp at the foot of the slide.

The surface in this locality is much more rugged than in Shuswap, there being less bottom-lands and the bench lands being much more sloping. Practically all the best farming lands in this district are held by timber berth leases and immediate settlement is prevented. There are plenty of large fir on the bench lands here and less hemlock than on the lake, but the most valuable and accessible patches of timber are under timber berth licenses. The south half of this township is very rocky on the east side of the river, and is useless for agricultural purposes. The soil in this district is mostly clay loam, and the settlers are getting exceedingly good results. Some hay lands occur along the river, but the floods deposit so much mud on the hay that I am told it is next to useless. I think that this district is best suited to raising small fruits as these require little moisture after July. We noticed some grouse, rabbits, ducks and a great many signs of black bears in the district, while goats, caribou, deer and grizzly bears were found above the snow-line.

Lumbering is the chief industry, there being a large mill at Arrowhead, and many camps at various points on the river and on the Arrow lakes.

A wagon road is being built from Revelstoke, and during the present year was completed to the north boundary of this township. The Arrowhead branch of the Canadian Pacific railway also gives ready access to this district.

On completing the work here, I moved into township 24, range 2, west of the sixth meridian, to survey some legal subdivisions which are withdrawn from timber berths. As this township adjoins the town of Revelstoke, the lands here are decidedly valuable, and although the available farming land is limited in extent the soil is very rich, and the land is practically all logged off, making clearing very easy. Settlers in this district are making money hauling cord-wood to Revelstoke. A good wagon road runs through this township. I left Revelstoke on November 3 and moved to Golden. Fearing early snows I decided to survey the higher lands first, leaving the flats till later and accordingly placed my camp on Hospital creek, about three miles by road from Golden.

The country in this district is more easily accessible than the valley south or north of Revelstoke, wagons being used almost entirely. There are more bottom-lands and considerably more bench lands here than in the lower Columbia valley, and as most of these benches are lightly timbered, they are very easily cleared. The land



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being much less rolling, such crops as fall wheat are raised and yield good results. The uplands, over 3,500 feet above sea-level, are frequently found covered with hay which makes fair pasture. Small fruits do well here but up to the present no fruit trees have proved a success, the trees all beginning to bear profusely in the second or third year and succumbing early. Root crops, however, do well.

The Columbia River Lumber company have a large mill at Golden which is at present supplying the town with electric power and lighting. This company own large limits in this district and furnish employment to hundreds of men.

The Kootenay Central railway, which is to run from Golden to Cranbrook, is being pushed rapidly to completion, and will open a large and fertile country to the south.

As in Revelstoke, fuel is rather expensive, and the settlers were making money this fall selling cord-wood, some of which was cut within a mile of the town. A great many logs have been taken out by settlers in this township, and a great deal of cord-wood has been cut under permit. This has removed the bulk of the large trees, and in many cases clearing would be easy, the second growth being mostly poplar, birch and jackpine.



## APPENDIX No. 51.

## ABSTRACT OF THE REPORT OF J. N. WALLACE, D.L.S.

## SURVEY OF PART OF THE FOURTH MERIDIAN.

During the season of 1909 the fourth meridian was surveyed as far as the twenty-first base line, at the north of township 80. This last season it was continued to the middle of township 95, being a further distance of eighty-seven miles.

I had sent a large quantity of supplies from Edmonton, expecting to be able to get them up to township 80 on sleighs, but as a road had to be cut out, and the spring opened up nearly a month earlier than in 1909, the result was that these supplies had only reached township 71, when the snow suddenly went off, and they had to be cached there. Subsequently they had to be taken north on packhorses, and during the season I had to pack everything from township 71 until the line reached McMurray (formerly Clearwater) river in township 89, a distance of one hundred and eight miles in a straight line, and about one hundred and fifty miles by pack-trail.

In order to carry the survey north of McMurray river, it was necessary to find some means of transportation other than by pack-trail along the meridian from Cold lake, and two routes presented themselves. One of these was to follow the old route from Prince Albert, by way of Isle a la Crosse and Methye portage, to McMurray river. The other was to send freight in scows down Athabaska river to McMurray and from there up McMurray river.

By the Prince Albert route freight can go by railway one hundred miles northwest to Big river. From there it must go to Isle a la Crosse by sleighs in winter, then to the north end of Buffalo lake by steamer, and from there to the head of Methye lake by caloes. From what I know of the difficulty of getting freight from the north end of Buffalo lake to the crossing of the meridian on McMurray river I do not think this route would be satisfactory.

By the Athabaska route there is no great difficulty in getting freight to the Cascade rapids on McMurray river. There are no rapids between McMurray and this point, which is only twelve miles west of where the meridian crosses McMurray river.

For the next eight miles above Cascade rapids there are many other rapids. There are fairly good portages past them all, and in former years these were utilized, and freight went right up to the end of the wagon road leading from McMurray river to Methye lake, then down this wagon road and so to Prince Albert. However, when freight has to ultimately go only as far as the fourth meridian which crosses the river about twelve miles above the Cascades, and only three miles above the last of the other rapids, it does not pay to take it over these portages and use the short stretches of navigable water intervening between them. It is much better to have freight taken in scows to the Cascades, and from there on to the meridian by pack-horses or sleighs.

Before leaving Edmonton in April to commence work on the survey of the meridian I ordered a large amount of camp supplies and oats. These together with some sleighs and harness and a number of survey posts were to be sent to Athabaska Landing, and from there to be taken on contract to Cascade rapids on McMurray river, or farther up the river, as circumstances would permit. The total weight of all was fourteen tons, and the rate was six dollars from the Landing to the Cascades. One of my survey party went with this freight as it is necessary to send some representative to see that proper care is taken of it, and moreover a house had to be built at



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the Cascades to hold the goods. There was practically nothing lost on the way, and the whole came through in good condition in face of the numerous small difficulties which are of such common occurrence in northern transportation. A very substantial house, capable of holding the entire load, was built on the north side of McMurray river at Cascade rapids, and this house should prove of value for several years.

On April 21, the party left Edmonton for Onion lake, and I followed next day. From Onion lake we proceeded to Cold lake, and then travelled northerly around the west shore of Cold lake, and Primrose lake to the intersection of the fourth meridian. So far we had used hired teams with wagons, but north of here we had only the pack-trail cut out during the season of 1909. Mr. Christie, D.L.S., has however this last season cut out a wagon road for some eight miles farther north ending at the northeast corner of township 68, range 1. Half of my packhorses were at the time engaged in picking up the supplies which had been left in township 71, so I could not take on all the party at once north of Primrose lake. This delayed the arrival of the whole party at Calder river so that we could not leave this river till May 23, when I had the full outfit of horses.

After five more days travelling north along last season's pack-trail we reached the north of township 79. From here a new trail was cut out, the old trail having been made in the end of the season of 1909, when the ground was frozen and it was not therefore fit for summer use. This new trail had to be cut almost due west for about five miles to avoid swampy land and then it turns north along the east side of Landels river to the junction of Graham creek. From there it runs northeasterly to a point about a mile west of the northeast corner of township 80, range 1, which was the nearest we could get to our starting-point, the survey having ended in 1909 at the north of this township. This involved cutting out altogether about eighteen miles of new trail.

Work was commenced on the meridian at the north of township 80, on June 2. Even here at the commencement of the season every pound of outfit and supplies had been packed on horses a distance of sixty-five miles from the cache where it had been left when the snow melted.

By July 1, seventeen miles of meridian had been run north but the great distance which supplies had to be packed proved a serious hindrance especially as the season became very wet after the middle of June. It was very dry farther south, but with us the country was flooded for weeks at a time.

The meridian reached the south shore of Garson lake on July 10; it runs almost across the middle of the lake, the distance being very nearly six miles.

The following is a general description of the country to this point, commencing at the north of township 80. For the first couple of miles the land is undulating, generally burnt over with much swamp area and many small lakes. After this it rises, and the timber is heavier. The land to the east is hilly with a generally hard and in places rocky surface. There is a general growth of large poplar on the high land, and small spruce grows thickly on the lower land. Newby creek, a stream twelve feet wide and four feet deep flows west across section 12, township 82. It is a tributary to Landels river, which it joins about twelve miles west. On both sides of this stream the country is composed of ridges of jackpine. There is hardly any grass along the creek the valley being very narrow and rising almost at the edge of the creek. For the remainder of township 82, the land is high and rolling, becoming more level towards the north where the line runs through small spruce partly burnt, with scattered patches of poplar. Jackpine is not so common as it is to the south. The soil in the spruce lands is the best, while the higher lands are composed of a surface soil of a few inches of black loam overlying a somewhat hard white clay with a few small boulders. This is the usual type of soil where large poplar occurs. This class of country continues to Kimowin creek, which crosses the line in section 24, township 83. There is some good land to the west of the meridian.



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For about half a mile north of Kimowin creek the land is dry and carries some large poplar and pine. It then becomes very swampy for about four miles, the line crossing a small lake, called Formby lake, which is surrounded by bog land. The northeast corner of township 83 falls in this lake, which drains westerly by a stream flowing to Landels river. Its surface is at an elevation of 1,670 feet, this being the lowest elevation met with on the meridian between Cold lake and McMurray valley. The district is exceptionally swampy with much flooded slough land, bog land and tamarack swamp.

About two and a half miles farther north the meridian intersects the south shore of Garson lake, the last mile before reaching this lake being through a high dry country covered with large poplar. It crosses the lake a little to the east of its centre, the distance along the line over the water being almost six miles. The intersection of the twenty-second base line occurs in the middle of the lake. From this point it is about three miles to the east shore and about five miles to the west shore. Measured along the meridian it is two and a quarter miles from this intersection of the base line to the north shore of the lake.

Garson lake is about ten miles long, running in a northeast and southwest direction, and about six miles wide. It contains about forty square miles. The lake is shallow, and, as the locality is very much exposed to the wind, the surface is seldom calm, consequently the water is generally very muddy from the fine sand which forms the bed of the lake.

Except on the southeasterly part the shores are low and very swampy, being almost surrounded by a belt of tamarack and spruce swamp half a mile in width. Along the southerly half of the east side of the lake, and for some distance around the south, the land is high and dry. There is a small Indian village consisting of seven or eight houses and a floating Indian population of about forty persons who remain there on account of the whitefish in the lake. Potatoes and other vegetables are grown here by the Indians and do well, as the soil is somewhat sandy. The village is situated at an elevation of about thirty feet above the lake in a small open area. There is no other open land near the lake, but there is a considerable area around the southeast of the lake which is only lightly covered with small poplar, and there is good feed for horses.

From Garson lake two routes can be travelled to the Hudson Bay post at Methye portage. The most direct runs a little north of northeast and is about eighteen miles in length. It is a purely winter road and while well opened out for one-horse sleighs it is quite unfit for travelling with horses in summer, as it runs through continuous swamp land. The second route takes a long detour to the south, and is about twenty-eight miles long. Packhorses can travel by this trail in summer, but if carrying a load there are breaks near both ends where canoes must be used. For freight going from the Hudson Bay post to Garson lake the only way is to have it taken in canoes down the west side of Methye lake for a distance of about two miles, and then across a small portage for a hundred yards into another small lake. At the south end of this lake the load is picked up by packhorses and taken southerly. A load cannot be taken directly from the post on horses as the trail down the south shore is too swampy and a deep inlet has to be crossed. From the south end of the small lake the trail runs southerly for about a mile along the lake, and then for about six miles south-westerly. A sharp turn to the west is made here and a new branch trail running westerly is used. After about thirteen miles on this new trail, which runs through dry poplar and pine country, the crossing of Garson river is reached. The last half mile to the river is through a very bad tamarack swamp. The load is taken from the horses at the river and sent about three miles up this river in canoes to Garson lake.

Garson river is here a very slow deep stream, about fifty feet wide, with a belt of slough land extending on each side from fifty to three hundred feet. The river leaves the lake about three-quarters of a mile north of the Indian village.



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From the foregoing it will appear that, although on the map it may look as though Methye portage would be a good basis for supplies for the survey of the twenty-second base line west of the fourth meridian, it is really practically useless for this purpose unless freight is sent across to the Indian village at Garson lake in winter.

A route which might be feasible for summer is the following: Freight from Buffalo lake could be left at a small settlement on the west shore of Methye lake about five miles south of the Hudson Bay post. From here it could be taken by teams a few miles southwesterly across a portage to Garson river, and then sent up this river in boats to Garson lake. This river is navigable for boats.

On the whole, however, I think the best way to get freight to this base line would be by McMurray river, a trail being cut southerly to intersect the base line some miles west of Garson lake. The immediate neighbourhood of the meridian should be avoided for at least the southerly twelve miles, as it is very swampy.

By July 22, all the camp had been moved across Garson lake and the meridian was surveyed up to the north of township 85.

We had much trouble getting the outfit to the north of Garson lake, owing to the swampy nature of the country around the northeast. The horses could barely get around without any load, and we had only one small boat and a couple of birch-bark canoes, the latter only able to carry a man and about two hundred and fifty pounds of freight. A small stream, called Pennel creek, flows into the north of the lake, its outlet being a few hundred yards east of the fourth meridian. We used it for transportation for about two miles up from the lake, and this got us over the worst of the swampy area.

North of Garson lake the meridian runs through much swampy land, the country rising slowly. The timber is small pine, spruce and tamarack, and the surface all moss covered. Just north of township 85, we encountered another lake with very swampy shores around which we could send the horses without loads only, and had to make a raft to carry the outfit across. There has been so much rain that the shore of this small lake was flooded for over a quarter of a mile inland, and the ground was so soft and boggy that a man would sink in it to his middle, although the water was so shallow that we had trouble in getting a raft to float over the reeds.

Although this lake is connected by a creek flowing from its southerly end to Garson lake, and there is a fall of over forty feet between the two lakes in a distance of four miles, yet for several weeks the stream could not carry off the water quickly enough to cope with the flood. North of this lake for about two miles the country is swampy and partly burnt over. The land then rises and much poplar country is met with in the north of township 86. Through township 87, the country is generally dry and rolling along the meridian, and westerly from it. There is much poplar country and some good land out towards Gipsy lake, the east shore of which is about eight miles west of the meridian. East of the meridian there is, however, much swamp land, an extensive area extending out to Methye lake, and there are many small lakes in the district.

The west end of a very large swamp is crossed in sections 1, 12 and 13, in township 88, the swamp extending for two miles and a half along the meridian, and easterly as far as the road from Methye lake to McMurray river, widening as it goes to the east. The intersection of the twenty-third base line occurs about a quarter of a mile before the sudden descent to McMurray river begins.

On August 31, camp was moved to the south shore of McMurray river. The long haul of supplies from township 71 was over, and fifty miles of line had been run under greater difficulties than I, at least, had ever before encountered.



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The valley of McMurray river, where it is crossed by the meridian, is badly broken by ravines on both sides. The horizontal distance between the edge of the high land on the south and on the north sides of the river is nearly three and a half miles. The valley is somewhat wider here than elsewhere in the neighbourhood, as a long tributary valley, running northwest, cuts up the land on the north side of the valley. The depth of the valley from the high land to the water of McMurray river is six hundred feet on the south side, and eight hundred feet on the north side, and there is very little level land near the river. The elevation of the edge of the high land on the south side of the valley is 1,750 feet, and that of the river is 1,145 feet, a total fall of 605 feet in a mile and a quarter, much the greater part of this occurring in the first half mile from the top. The descent is very rough and broken by ravines. The lands are all thickly timbered with poplar and spruce of large size. Within ten miles of the meridian on either side there are only two small open spaces. Both of these are on the south side of the river. One is at the end of the portage road from Methye lake. It has an area of about thirty acres. The other is about a mile west of the crossing of the meridian, and contains about seventy acres. Much of the latter is very wet from springs.

There are many areas of good soil in the valley but it is all very thickly timbered. Spruce and poplar up to two feet diameter are common, and there is a large amount of birch up to eight or ten inches. There are many areas of timber of commercial value, especially farther down the river.

To the north of the river the land rises suddenly, attaining an elevation of 220 feet higher than the water in a little over a quarter of a mile. The northerly slope of the valley is very rough. The edge of the high land to the north has an elevation of 1,935 feet, being 790 feet above the river, although a local ridge some thirty feet higher is crossed before reaching the north edge.

McMurray river varies very much in width along its course. It averages about one hundred and twenty yards. The immediate bank of the river is from three to ten feet high. The bed of the river is usually a hard fine sand. The depth of water varied along its course from three to ten feet in the latter part of August. The season was an unusually rainy one and the water was high all summer. The water is very good, but not remarkably clear. The river is not too swift for a raft, but swift enough to make rafting a very slow means of crossing. It is much better to have a canoe. There are practically no open spaces along the river near the meridian, but enough grass occurs, scattered among the poplar, to feed packhorses for a short time. Horses cannot ford the river anywhere as they would have to swim at least half the width.

The nearest rapids to the meridian are Whitemud falls, which are about three miles west of the crossing of the meridian. The total fall here is probably between forty and fifty feet, and this should be valuable for water-power. To the east of the meridian there are no rapids for about seven miles. Above that it is reported that small rapids are so numerous as to render the river unsuitable for navigation.

By September 13, we had surveyed the meridian as far as the high land on the north side of the McMurray valley, after a very laborious time in getting across this very rough area. From here it runs across a country almost entirely timbered with jackpine. Small local depressions occur carrying spruce, but jackpine is much the commonest timber. There are very few swamps. An extensive area of swamp land occurs across the east of section 13, township 90, and the greater portion of the east of section 25 in the same township is also swamp.

Sutton creek crosses the meridian in section 25, township 90. It is a deep stream about fifteen feet wide, flowing west. The current is rapid, and the water is good.



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North of Sutton creek there is very little swamp area, much the greater part of the district being composed of low rolling ridges with very sandy soil, while the timber is practically all jackpine. These ridges become small hills farther north, and wet land of any kind becomes extremely rare. The general elevation of the country is very high, averaging about eight hundred feet higher than McMurray river at the crossing of the meridian. These rolling hills and the general high elevation extend for at least ten miles on either side of the meridian, and fifty miles north of McMurray river. There must be a very large fall in the surface somewhere between the meridian and Athabaska river to the west, and ultimately a great drop in elevation in the north before Athabaska lake is reached.

All the streams crossing the meridian north of McMurray river flow westerly. For some reason many of them have an area of very wet land on either side. For a distance of a hundred yards or so on either side the land is so soft and wet and full of holes, that it is impossible to get horses up to the stream, without first making a roadway, and water cannot be obtained for camp purposes, without getting wet up to the knees. These borders of wet land are more like rough slough land than anything else. The streams flow in a depression, with a hard, dry ridge on either side, but the space intervening between the edge of the ridge, and the stream is nearly always boggy. It is not caused by flood water, for even in times of low water, the same conditions prevail. I think this wet border is due to springs coming out to the river, the rain water over the district having percolated down to a certain level through the sand, and then making its way underneath to the streams, instead of being discharged over the surface, into small tributary creeks, as is usually the case. One of the results is that it is very difficult for horses to get any grass, as there is little of it along the stream, and the ground is there too soft to support a horse.

On October 8, the meridian had reached the northeast corner of section 12, township 91. On this date I sent out thirteen of the horses with some of the party. The grass was practically all gone. We had been feeding oats since September 19, but the number of horses was too great to feed oats to them all. These horses were taken southerly along the meridian and after a difficult journey reached Cold lake, where they were left with the Hudson's Bay Co., and the men proceeded to Edmonton, arriving there on November 8.

I had ten horses left in camp, but as there was no snow we had to still use pack saddles, although such a small number of horses made packing a very slow means of transportation.

Through township 92, the land is generally rolling, becoming very hilly in the north half. The timber is nearly all pine, and the lands all dry, and generally very sandy. In the north half there are many small lakes in the hollows. These have hard dry shores and good water, although they have no streams either flowing into or out of them. In section 36, the meridian crosses a remarkable valley, the bottom of which is three-quarters of a mile wide, and one hundred and fifty feet below the land on either side, the descent being steep. The valley extends for about eight miles a little to the south of west where it joins a large valley running north and south. It also runs for some miles to the northeast of the crossing of the meridian. Viewed from the high land it appears as though it were the valley of a large river, but it only contains a very small creek flowing to the west through flat swampy land in the bottom. The valley is a purely local depression, the land on both sides being much higher for many miles, to the north and south. The general elevation of the country is about 2,000 feet, while that of the creek is 1,865 feet.

Fire has overrun the whole country north of McMurray valley in comparatively recent times. As far north as the middle of township 92, the last fire appears to have occurred about four years ago. These fires were very extensive owing to the absence of any large streams or swamps to stop their course.



This last fire was not strong enough to entirely burn up the timber and a small proportion of the trees still have green tops, although scorched lower down, and even those entirely killed have not had their branches or bark burnt off and have not yet fallen. These latter will make travelling difficult in the next few years, as they will soon blow down. Over this area a light growth of new pine, now about eight inches high, is coming up, but it looks feeble.

North of the middle of township 92, the last fire appears to have occurred about fifteen years ago, and there is now no standing burnt timber, but the ground is strewn with much small windfall. The new growth of pine is very dense through the north half of township 92, and through township 93. It is generally only about ten feet high, but looks strong and healthy. There are small isolated patches of unburnt living pine averaging about six inches in diameter, scattered irregularly over the district, these having for some reason escaped the general conflagration.

If the past history of the area north of McMurray valley is to be judged by the extreme scarcity of any timber over a few inches in diameter, either now living or dead, it is a history which does not augur well for the future chances of the new growth now coming up. The last growth is only eight feet high, and the previous growth was not given a chance to attain over a few inches in diameter. The same record of new growth coming up to replace the one destroyed by fire, only itself to be destroyed before it could reach maturity, has probably been going on for centuries. Fires have not only destroyed the timber but they have burnt off all the decayed vegetation which formed about the only source from which these sandy areas could have derived fertile soil.

It is too late now, even if fires were kept out, for soil to accumulate, but jackpine can grow on these sandy areas where apparently nothing else can grow, and if given a fair chance it will grow at least twelve inches in diameter.

While no doubt there are a few other causes of forest fires in the north, the main cause is a camp-fire left smouldering. The average traveller in that country knows enough to keep a fire under control when he is lighting and using it, but he does not know enough to see the necessity of extinguishing it when he is done with it. The cases where a man cannot extinguish a fire for want of water or for some other cause are very few. The cases where, when he is leaving, he looks back at the half extinguished fire, knows there is a risk, but deliberately chances it, are very common; and such cases are not due to laziness, but are often due to that fault of character, especially common in the Northwest, which thinks it a weakness to take precaution against a danger rather than to risk its occurring.

On November 10, the meridian had reached the north of section 13, township 94, a distance of thirty-one miles north of McMurray river. The snow had been sufficiently deep to use sleighs on November 5, but some of the swamps were not then sufficiently frozen to carry horses. On November 10, the horses were sent back to McMurray river to bring up the sleighs which had been sent down from Edmonton with the McMurray freight, and were now at Cascade rapids. The teams were delayed by the swamps not being sufficiently frozen, and did not get back to camp until November 26, by which time the meridian had been surveyed up to the north of township 94. From McMurray river we had throughout been cutting a sleigh road in addition to a pack-trail, and this road was now called into use. There is now a good sleigh road from the house at Cascade rapids on McMurray river to the north of section 13, township 95.

Through township 94 the country becomes very hilly. Jackpine is almost the only growth of any kind, and the soil is almost all pure fine sand with only half an inch of moss on the surface. The pine is generally very small, often only a few feet high, and does not grow thickly. Very little cutting is required even to make a wagon



## SESSIONAL PAPER No. 25b

road, and the surface is all dry. There are numerous small lakes in the hollows, most of which have no streams flowing into or out of them, yet these lakes are all within a few feet of the same elevation although many miles apart.

Township 95 is much more thickly timbered but it is all jackpine. Areas covered with six-inch pine now become much more extensive than farther south, and the surface is more hilly than ever. A remarkably rough ridge, about two hundred feet high, and running for some miles to the east and west crosses the meridian in section 12. The elevation of its crossing is 2,098 feet.

The survey of the meridian was ended at the north boundary of section 12, township 95, at a distance of thirty-seven miles in a direct line north of McMurray river, but apparently the high general altitude, the hills and the jackpine, and the generally barren surface extend for many miles farther to the north.

## LEVELS.

The levels taken last season along the meridian were continued this season using the same basis of elevation throughout. According to this basis the elevation of the water in Primrose lake, at the time of commencing the levels (May, 1909) is taken as 2,100 feet above sea-level.

The same instrument was used, a fourteen-inch dumpy level. The elevations recorded are the surface of the ground at every quarter of a mile along the meridian, all streams and lakes crossed by the meridian, and the surface of the ground, at the transit stations. These last being placed always on the summits of the local ridges may be taken as indicating the higher elevations in the vicinity, while the levels on the streams and lakes indicate the lower elevations.

Bench-marks were left at intervals seldom exceeding half a mile, generally near a section or quarter section post, but if a prominent large rock occurred elsewhere along the line a bench-mark was always recorded on it.

The levels were checked throughout, usually in sections of a mile or a mile and a half, by a second independent line run in the opposite direction. The only exceptions to this rule of running a second line occur for two miles in township 88, where a very bad swamp was crossed by the method of double turning-points, and also when crossing part of McMurray valley where there is a fall of 600 feet on the south side and 800 feet on the north side, and the surface is very broken. This valley was levelled across once in the usual way, and the levels checked by the use of vertical angles with the transit.

At the point of commencement of this season's survey, that is at the north of township 80, the elevation is 1,860 feet, or 240 feet lower than Primrose lake. As the meridian goes north the elevation remains within a few feet of this for nearly three miles when the land begins to rise, and at a distance of four and a half miles from the commencement the line reaches an elevation of 1,961 feet. From here it descends rapidly for five miles to the crossing of Newby creek where the water level is 1,756 feet. This stream flows west in a narrow local valley about fifty feet deep joining Landels river about eleven miles west of the meridian.

After leaving the valley at Newby creek the land rises steadily to the north, attaining an elevation of 1,804 feet after two and a half miles. It then descends for three miles to Kimowin creek, which is crossed in the middle of section 24, township 83, and is at an elevation of 1,674 feet. There is then a slow rise for three miles, the elevation reaching 1,714 feet at the north of section 25, township 83, north of which occurs a rapid fall of 44 feet in three-quarters of a mile to Formby lake where the elevation is 1,670 feet. This is a very swampy region. The lake is at the lowest elevation encountered in the whole distance surveyed in two seasons from township 64 to township 95, except only the local deep valley of McMurray river.



The low elevation continues for two and a half miles north of the lake, after which the meridian crosses a local ridge at an elevation of 1,734 feet in the north of section 12, township 84, and about a mile south of Garson lake. The ridge referred to between Formby lake and Garson lake forms part of the divide between the watersheds of the Athabaska and Churchill rivers. Formby lake drains westerly to Landels river, while Garson lake drains northeasterly and ultimately to Churchill river. The elevation of Garson lake is 1,675 feet.

North of Garson lake, although the land rises steadily, it is very swampy for several miles. At a distance of three miles north of the lake a total rise of fifty-one feet has occurred after which there is a fall of nine feet to the surface of a small lake, called Raft lake. This lake empties into Garson lake by a small creek flowing southerly, but, although there is a gradual fall of over forty feet between the lakes, there is so much moss and vegetation along its course that the land all around Raft lake is very swampy for want of more speedy drainage than this creek can afford, even with such a great natural fall.

The land rises north of Raft lake but is still swampy until the north of section 13, township 86, is reached. Here the land rises more rapidly, reaching an elevation of 1,824 feet in section 25, township 86, being a total rise of 149 feet in sixteen miles from Garson lake. Between here and the edge of McMurray valley there are only minor irregularities, the general elevation being about 1,750 feet. A large tamarack swamp is crossed in sections 12 and 13, township 88, at an elevation of 1,736 feet. The swamp drains both to the east and the west.

About a quarter of a mile north of township 88, the edge of McMurray valley is reached at an elevation of 1,750 feet. The river is at an elevation of 1,145 feet, a fall of 605 feet, occurring on the south of the valley.

A bench-mark was established on the north bank of McMurray river. It consists of a large iron post driven to within ten inches of the top, and stands fifteen feet north of the water's edge and in the centre of the line. The letters "B.M." with a broad arrow are cut on the south side with a cold-chisel. The elevation of the top of the iron post is 1,150.13 feet. The broad arrow cut on its side is 0.26 feet lower. It may be well to repeat here that all elevations given along the meridian are referred to one basis, and that according to this basis the elevation of Primrose lake in township 64, is taken as 2,100 feet above sea-level.

The north edge of the valley of the river is at an elevation of 1,935 feet, a rise of 790 feet from the water, and this high general elevation continues for many miles to the north. In the south half of section 1, township 90, an altitude of 1,984 feet is reached. From here the elevation falls to the crossing of Sutton creek in section 25 township 90, where it is 1,747 feet, being the lowest elevation met with between McMurray river and the end of the survey in township 95. The ridges now become more like small hills and the elevation steadily rises reaching an altitude of 2,063 feet in the north of section 24, township 92, and an altitude of 2,096 feet in section 12, township 93.

North of township 93, the district is very hilly being composed entirely of rolling hills from 100 to 150 feet above the small valleys. Local high points along the meridian reach an altitude of 1,950 to 2,050 feet, the lowest points crossed being a small creek in section 36, township 93, at an elevation of 1,890 feet, and two small lakes in sections 1 and 25, township 94, both of which are at an altitude of 1,884 feet although four miles apart.

A remarkably high and very rough ridge is crossed by the meridian in section 12, township 95, the elevation at the crossing being 2,098 feet. There is then a sudden fall to the north of section 13, township 95, where the survey ends. North of here, however, the land rises again and maintains the same general high altitude.

The divide between the waters flowing to Hudson bay and the Arctic ocean follows the neighbourhood of the fourth meridian for over fifty miles, never going more than a few miles to either side of the line. In this distance the divide crosses



## SESSIONAL PAPER No. 25b

the meridian five times. Its first crossing occurs in section 12, township 78, the elevation of the land here being about 2,000 feet. South of this the streams all flow easterly, and ultimately their water reaches Churchill river and Hudson bay. To the north of this place, for a distance of about twenty-eight miles, or as far as the north of township 82, the streams flow westerly across the meridian, all of them being tributary to McMurray river, which empties into Athabaska river at McMurray. The meridian then runs through an area extending five miles north and about five miles west, from which all the water flows east. Conditions are then reversed, the streams flowing westerly from an area extending five miles along the meridian and about three miles east. This reaches section 12, township 84, which is about a mile south of Garson lake, the elevation here being 1,730 feet.

The divide now passes around the south and west of Garson lake, including this lake and all its tributary creeks in the watershed of Churchill river. It then passes around the northwest of the lake, and crosses the meridian for the last time near the north of township 86, its exact location here being not very clearly defined. At this last crossing of the divide the elevation is 1,810 feet. It then runs northeasterly passing about half-way between the north end of Methye lake and McMurray river.

There are no well-marked topographical features along the course of the divide, and there is no apparent reason why it should occur where it does any more than in any other place.

The following are the elevations of some of the more noteworthy topographical features along the fourth meridian between township 80 and township 95.

Feature.	Locality.		Elevation.
Creek .....	Sec. 1	Township 81	1859
Creek .....	" 13	" 81	1845
Summit .....	" 13	" 81	1889
Depression .....	" 24	" 81	1851
Summit .....	" 25	" 81	1961
Newby creek .....	" 12	" 82	1756
Summit .....	" 13	" 82	1804
Creek .....	" 24	" 82	1785
Creek .....	" 25	" 82	1717
Summit .....	" 1	" 83	1763
Kimowin creek .....	" 24	" 83	1674
Summit .....	" 25	" 83	1714
Formby lake .....	" 36	" 83	1670
Summit .....	" 12	" 84	1734
Garson lake .....	" 13	" 84	1675
Raft lake .....	" 1	" 86	1717
Summit .....	" 25	" 86	1824
Creek .....	" 25	" 87	1732
Creek .....	" 12	" 88	1731
Summit of valley .....	" 1	" 89	1753
McMurray River .....	" 12	" 89	1145
B. M. on top of iron post 15 feet north of river .....	" 12	" 89	1150-13
Summit of valley north of McMurray river .....	" 24	" 89	1935
Summit .....	" 1	" 90	1984
Sutton creek .....	" 25	" 90	1747
Creek .....	" 25	" 91	1826
Summit .....	" 36	" 91	1934
Creek .....	" 1	" 92	1819
Summit .....	" 13	" 92	1922
Lake .....	" 13	" 92	1878
Summit .....	" 24	" 92	2063
Creek .....	" 36	" 92	1865
Summit .....	" 1	" 93	2046
Lake .....	" 1	" 94	1884
Summit .....	" 13	" 94	1988
Depression .....	" 24	" 94	1887
Summit .....	" 25	" 94	2013
Depression .....	" 36	" 94	1881
Summit of ridge .....	" 12	" 95	2098



As many areas of swamp land occur along the line of the fourth meridian a few remarks on such areas may not be out of place. The swamps over this district are not individually extensive. They are nearly all formed by the surface water being unable to get an outlet through the local surrounding ridges, and not because the entire surface of the country is so level that the water cannot drain off in any direction. The standing water over many swamps will frequently be found to be many feet higher than the water in streams within a few hundred yards of them, some intervening ridge cutting off the outlet. Even in the case of an extensive swamp it will often occur that an outlet could be made with little labor at some place around its border, and so the water could drain off the whole swamp.

The general surface of the country is rolling, yet although locally there is ample fall to carry off the surface water there is no continuous connection from one level down to another, which would ultimately discharge the collected surface water into some stream, nor is there even a continuous fall from several different directions into the larger depressions, which would result in a few large lakes being formed, in place of the many local areas of half-flooded swamps, which now exist.

In uninhabited districts, where the contour of the surface is that originally formed by nature, the greater number of the local depressions are not connected, but form a series of basins. The water from rain and melted snow will run down into the lower levels, no matter how little they may be lower than the surrounding lands, so every depression carries more than its own share of surface water. The slowness of the evaporation in these northern latitudes is emphasized by the general growth of timber, which cuts off the sunshine, and also by the absorbent nature of the mossy surface. There is always some substratum, (it may be many feet below the surface), which prevents the water readily draining downwards. The result of all these conditions is that the water lies in these depressions for so long a period each year that the surface becomes soft, and swamps are formed in nearly every depression.

The same natural conditions of surface level occur in many countries, but the unconnected lower depressions will not become swampy without the additional conditions of abundance of rain, some impenetrable substratum, and some impediment to evaporation. It is the combination of all these conditions in the timbered lands of the north, which produces so many areas of swamp.

Not only are these swamps a perfectly natural result, and a result which should reasonably be expected to exist, but their value is altogether greater than is popularly supposed to be the case. In many of the areas over the north, the greater part of the surface of the country appears to have been originally composed of pure, fine yellow sand. This is especially the case where the country is covered with coniferous timber. There are many districts where a person may travel for days, and see only the same succession of jackpine, spruce, and tamarack with practically no other timber. Where poplar is found, the sandy conditions are not as a rule nearly so marked, and birch indicates hard stony soil, but in the coniferous areas, it will be found that fine sand occurs everywhere, either coming up to the surface, as on the ridges of jackpine, or else existing immediately below the moss and black surface soil of the spruce areas in the lower lands. In such areas almost the only source of fertile soil has been the accumulation of decayed vegetation during past ages. This has been derived from the fallen needles of the pine and spruce trees, and from the growth of moss in the lower lands. Were it not for fires there would now be a great depth of such soil both on the higher and lower lands. But, on account of the prevalence of fire, land free from surface water has been burnt over again and again, with the result that surface conditions on the dry lands in such areas have changed but little from the time when the sand was first left there.

In the lower levels, the slow evaporation has kept the surface wet and has not only fostered the growth of vegetation, especially moss and lichens, but has tended to preserve these areas from fire. The much maligned spruce and tamarack swamps



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are really about the only features which have saved many large areas in the north from being almost entirely destitute of any available fertile soil.

Were these swamps so level that large expenditures would be necessary to drain them, no doubt it might be urged that, if the surface water has been the cause of preserving the soil, it has done so at the cost of making the soil now unavailable, but areas of swamp land so level as this are not common. The usual swamp has ample fall, even over its own apparently level surface, to allow the water to run off. If the surface were free of the obstruction of moss and sticks, or else it only needs a short outlet cut through some local elevation to drain itself naturally into some neighbouring stream.

Such areas must be drained before being available, but the mere cost of draining will not be great, and so long as the country is uninhabited, and fires continue to run, the want of drainage, whether caused by want of outlet, or by obstruction by the moss, is a blessing in disguise. It is that very surface water, which so many people think makes these swamp areas worthless, which has really been not only the origin, but the means of preserving the greater proportion of the available fertile soil over many large areas in the north.

The contention that in these sandy districts, a natural condition of surface contour which impedes drainage is better than a condition which lends itself to the speedy draining of the surface water into streams and lakes receives support in the conditions, which can be seen to-day, north of McMurray river. Here the land is so rolling that local undrained depressions are very rare, and swamps of a greater area than a few acres are almost unknown. The soil is nearly everywhere pure yellow sand, coming right up to the surface. The surface has been too sandy to allow the growth of vegetation without standing water, and no fertile soil has accumulated. The country has been too well drained. The area is timbered everywhere with small pine, but the fires have continually burned off the fallen needles, before they had time to decay, and there is now nothing left except a surface, which has only a few lichens growing over it.

Were it not for the general growth of jackpine (which appears to be the only thing which will grow in this area), there are many square miles here which would be composed of nothing but wind-swept hills of sand. Had this area been less rolling, and had there been more undrained depressions, which would have shut in the surface water, and have retained it, so as to form swamps, there would to-day be many acres which could be drained, and which would then afford fertile soil. Instead of there being nothing now left but well-drained sandy hollows.

North of McMurray river, there are very few areas of swamp, while south of it swamps are common, and there can be no doubt whatever, that the district, which contains the swamps, is much more valuable than the other.

On November 28, the last day's work was done on the meridian, and next day, all the party were moved back southerly to a small lake crossed by the meridian in section 12, township 92 where a supply house had to be built. The sleighs were then sent to McMurray river, to bring up supplies. They reached camp on December 7. The house was by that time finished, and the remainder of the party moved to the river, reaching there on December 9. The sleighs then made a trip to the house at the Cascades, and brought up all the goods remaining there, and these were placed in a cache on the meridian, about two miles north of the north edge of McMurray valley, close to the northeast corner of section 25, township 89.

On December 13, a start was made for Methye portage, and it was reached on the 15th. The distance from the meridian to the road running to the lake from McMurray river is about seven miles. The ice was just strong enough to carry horses, but there was still some open water in places. From the river, it is twelve miles to Methye lake, and then, eight miles southwesterly, across the lake, to the H. B. post. There is a summer trail around the west shore, but it is unfit for use with horses.

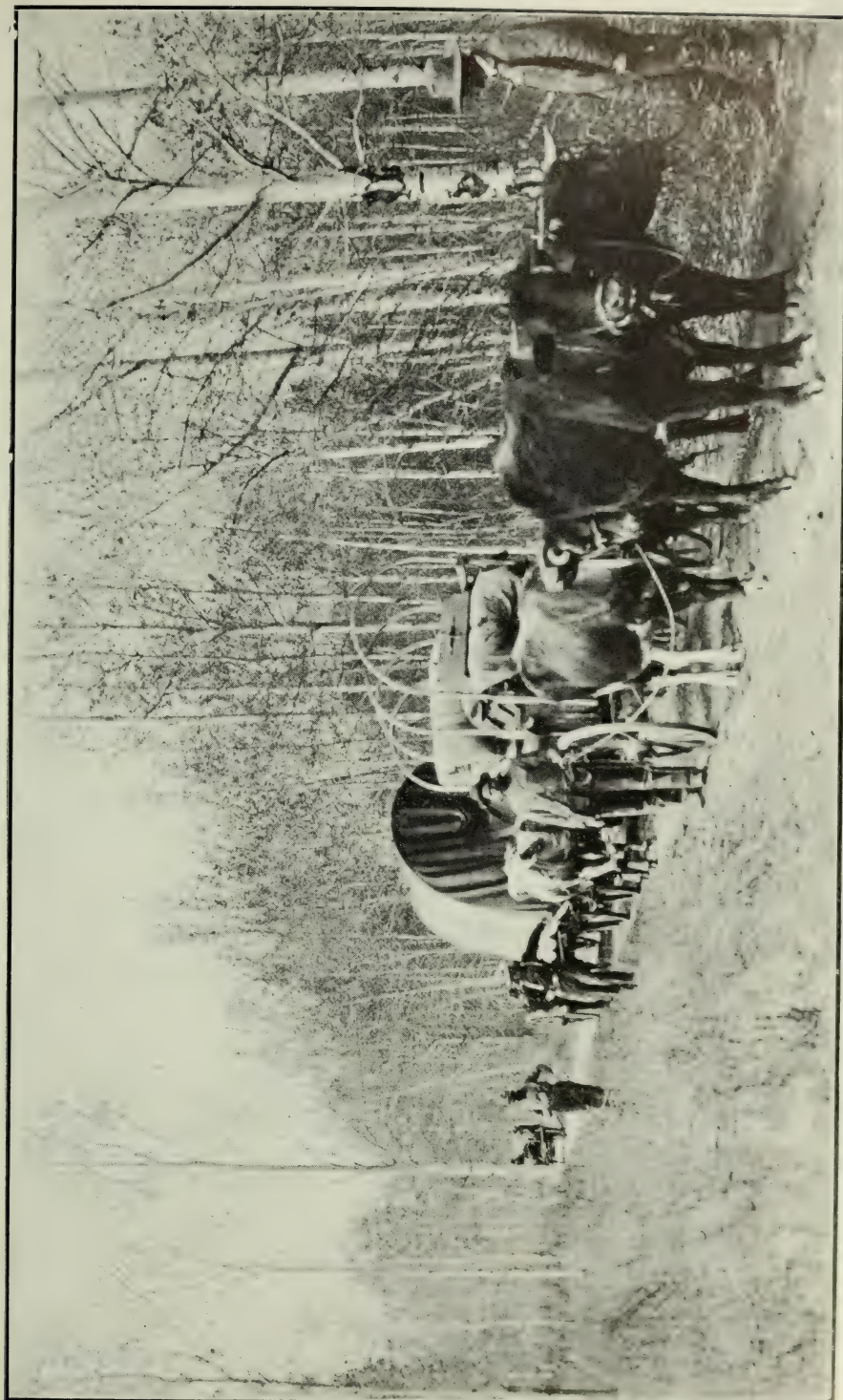


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We left Methye portage on December 17, and travelling over the ice of Methye lake, and Buffalo lake, reached Isle a la Crosse, on December 23, a distance of one hundred and ten miles. From there we travelled to Green lake, and thence to Big River, and getting a train there, reached Prince Albert on the evening of December 31.

The total distance from Methye portage to Big River is 275 miles. The ice was fairly good throughout.





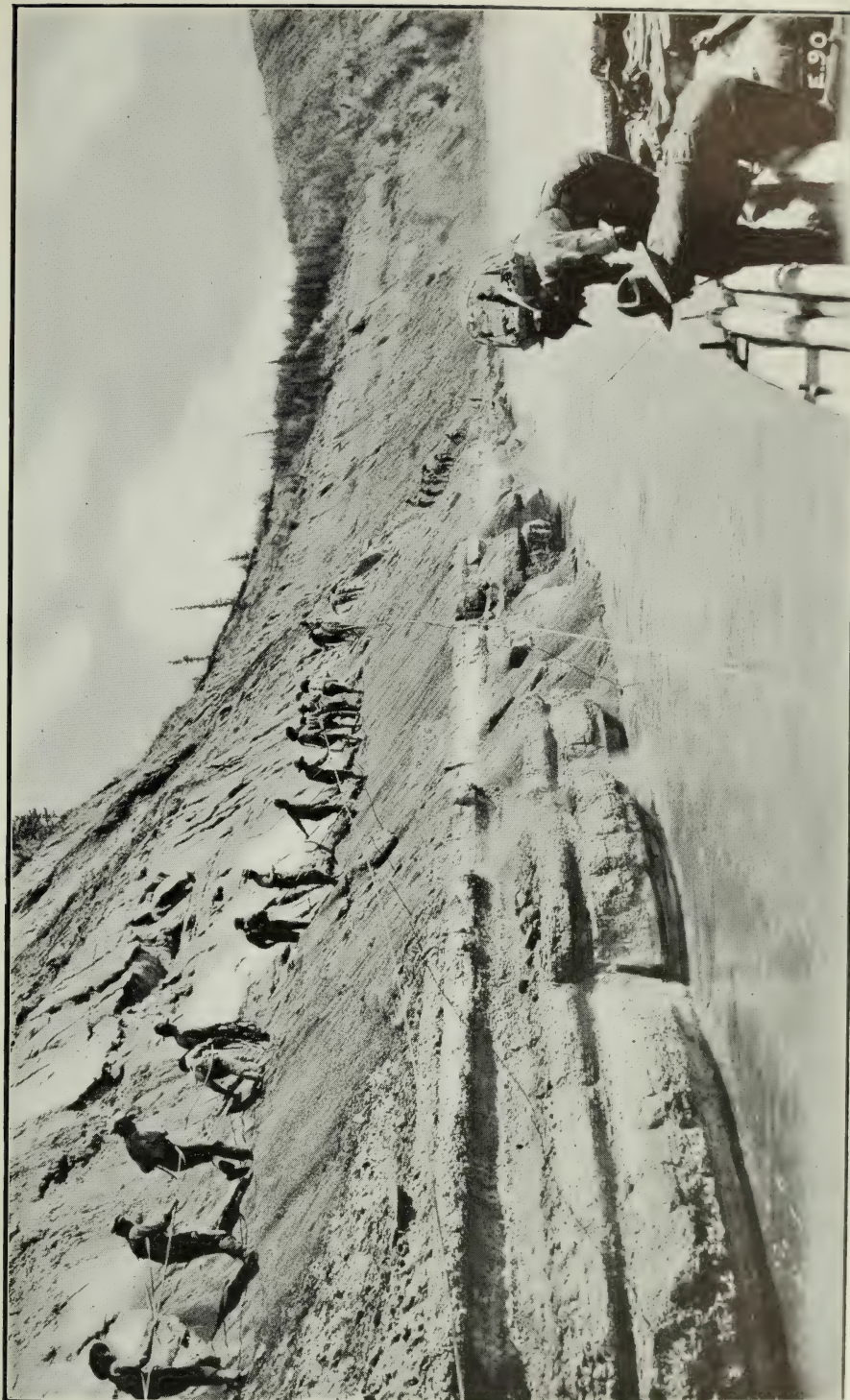
Settlers on road to Athabaska Landing.

Photo by C. Engler, D. L. S.









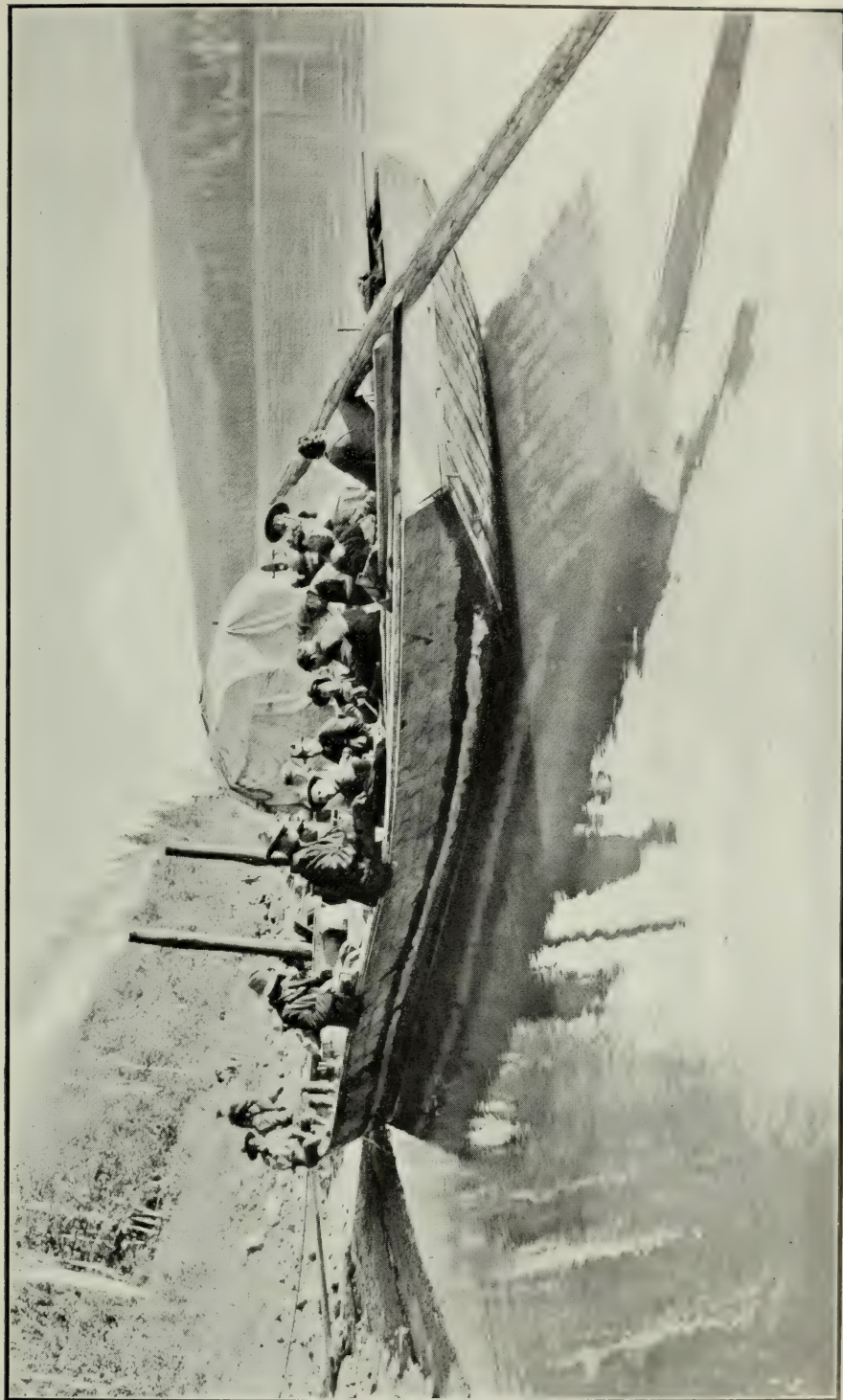
Tracking on the Athabaska river.

Photo by C. Engler, D. L. S.









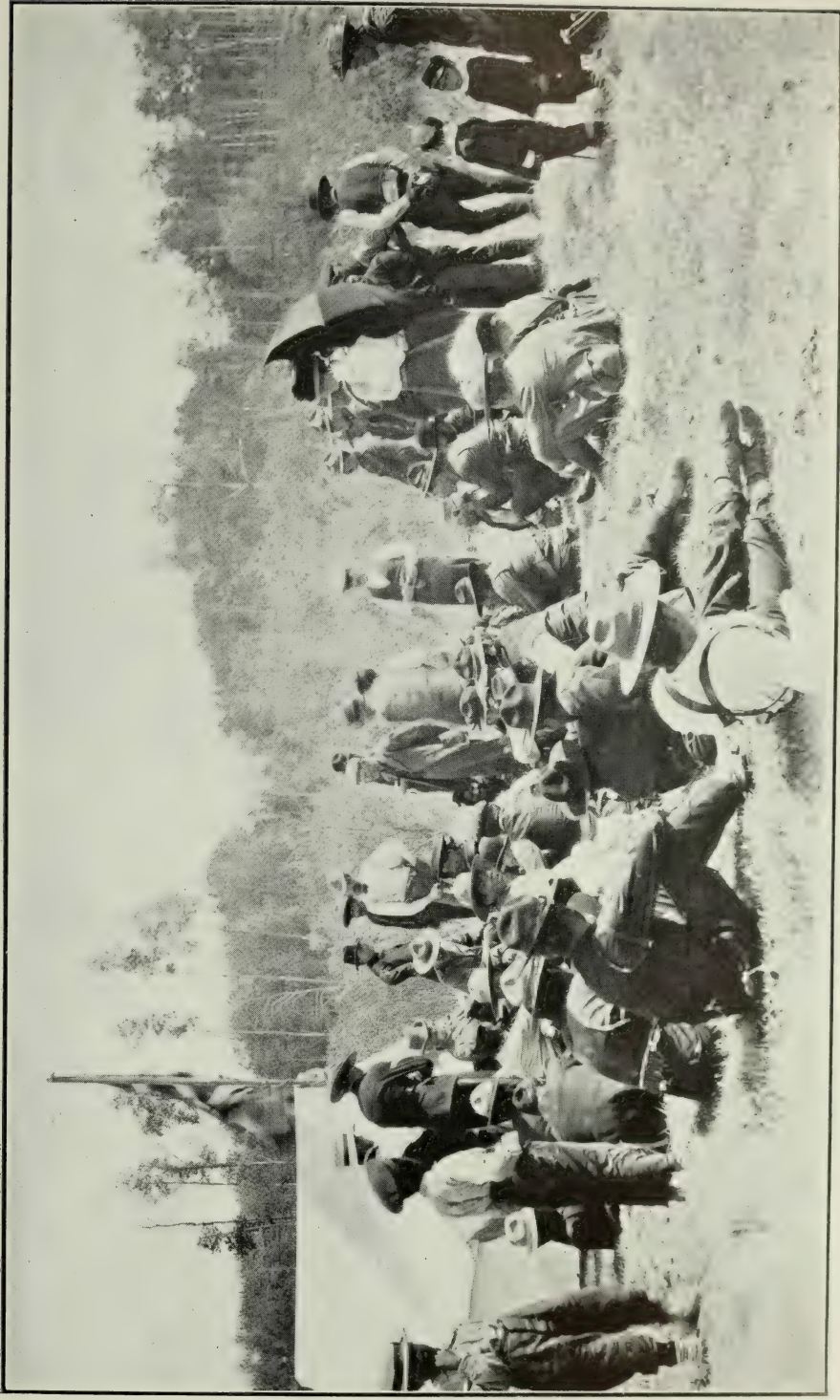
The passengers' supper in the cook's scow, Athabaska river.

Photo by C. Engler, D.L.S.









Paying annuities to Indians at McMurtry.

Photo by C. Englen, D. L. S.







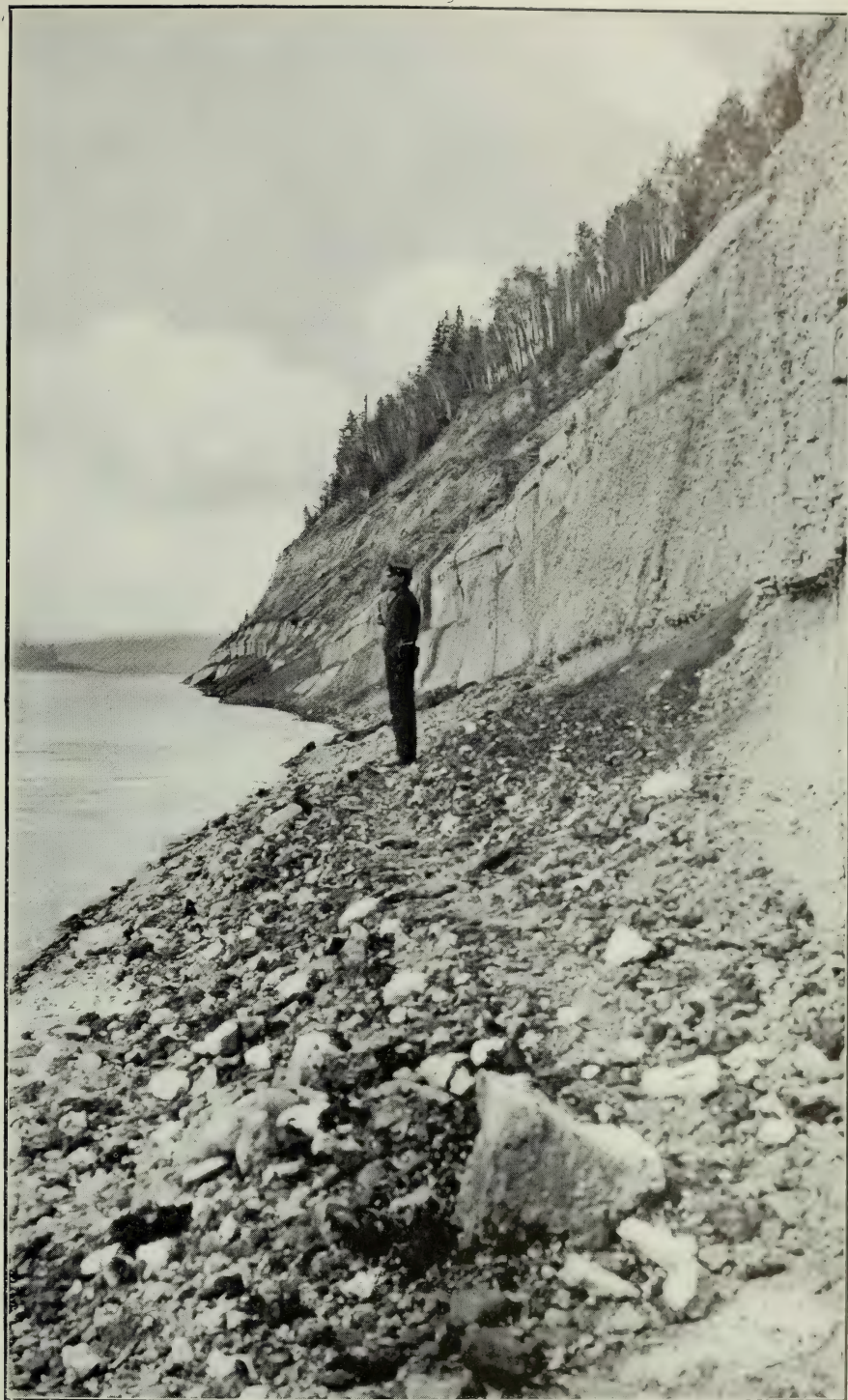


Photo by C. Engler, D.L.S.

The tar sands on the banks of the Athabaska river above McMurray.







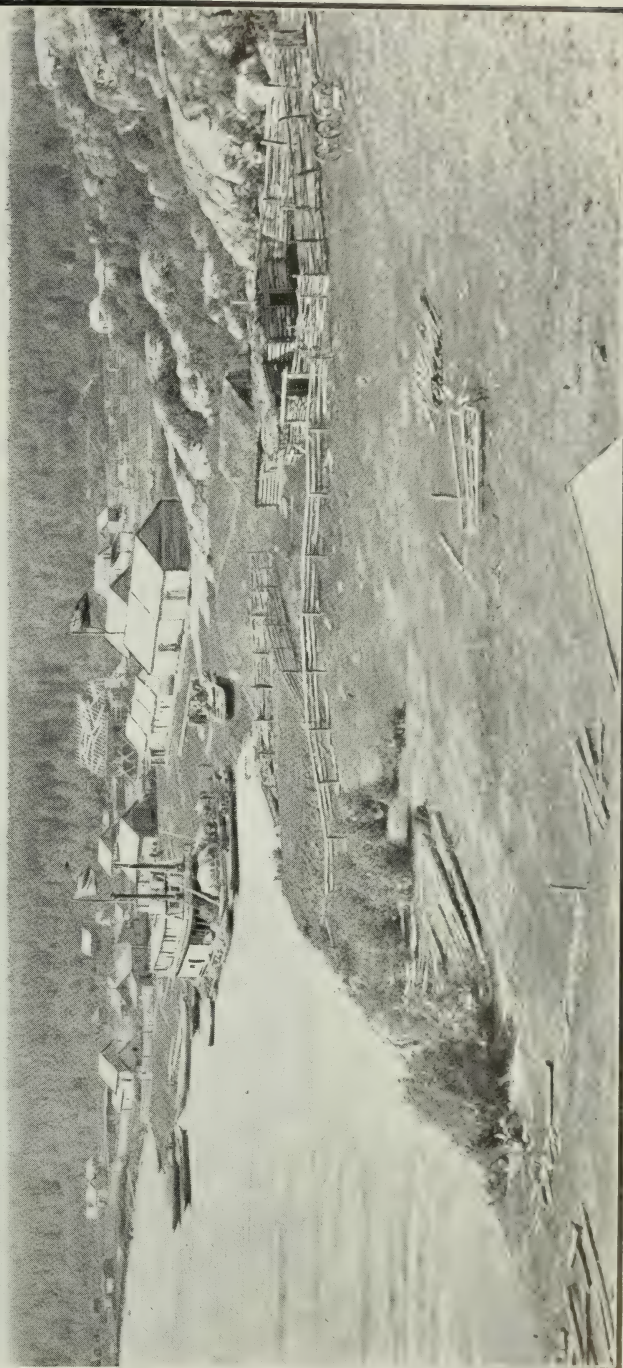


Photo by C. Engler, D. L. S.

Smith Landing.







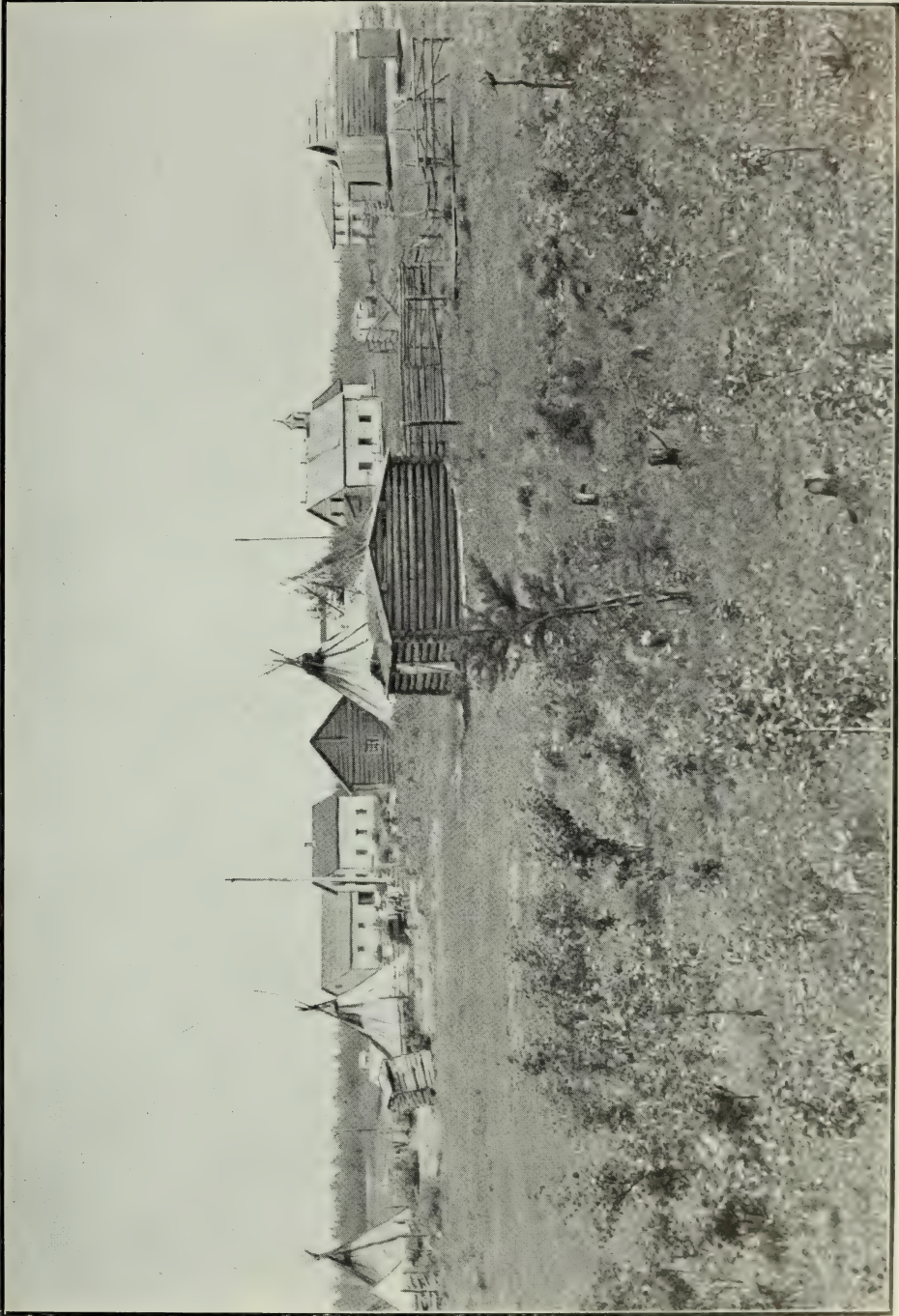


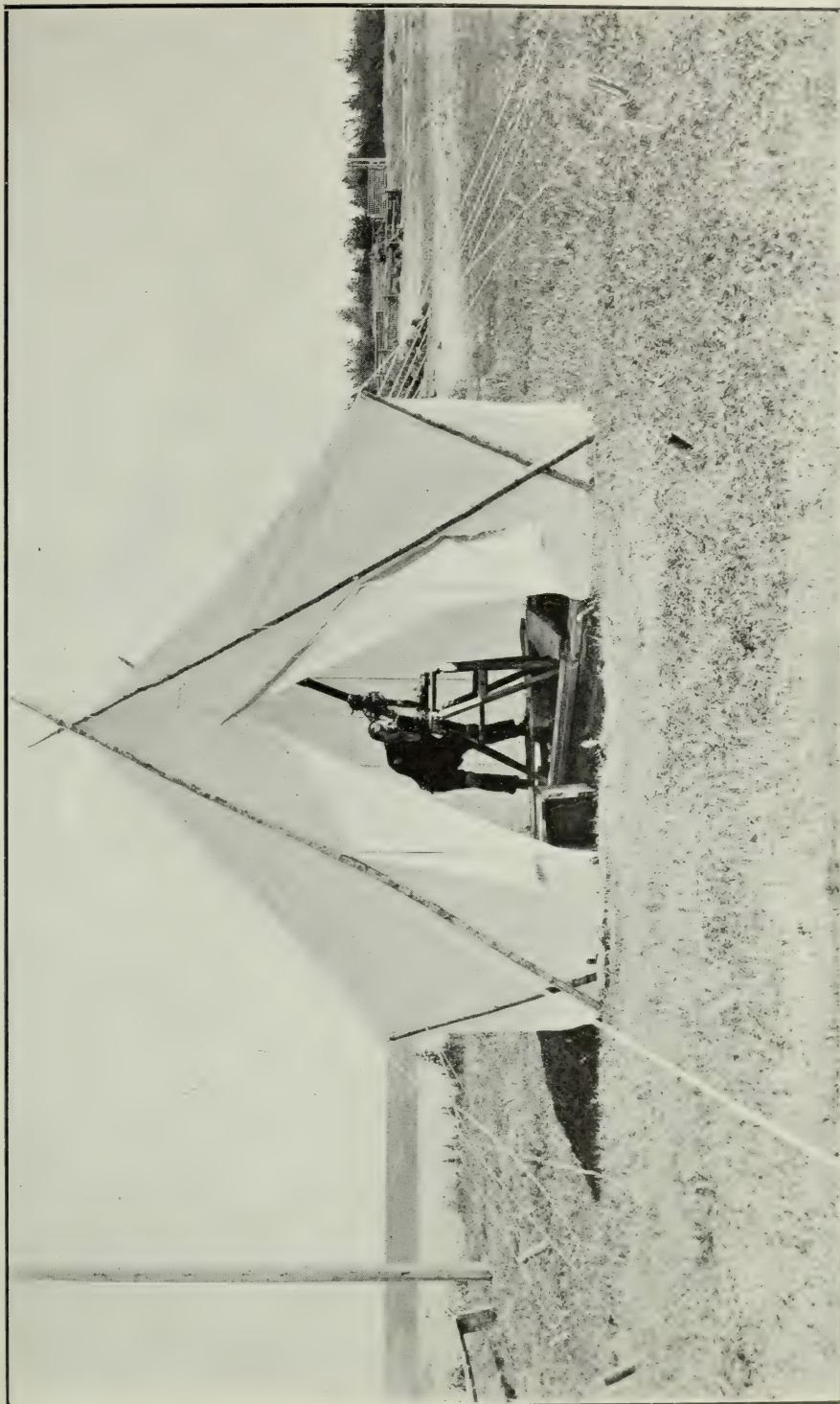
Photo by C. Engler, D. L. S.

Fort Smith.









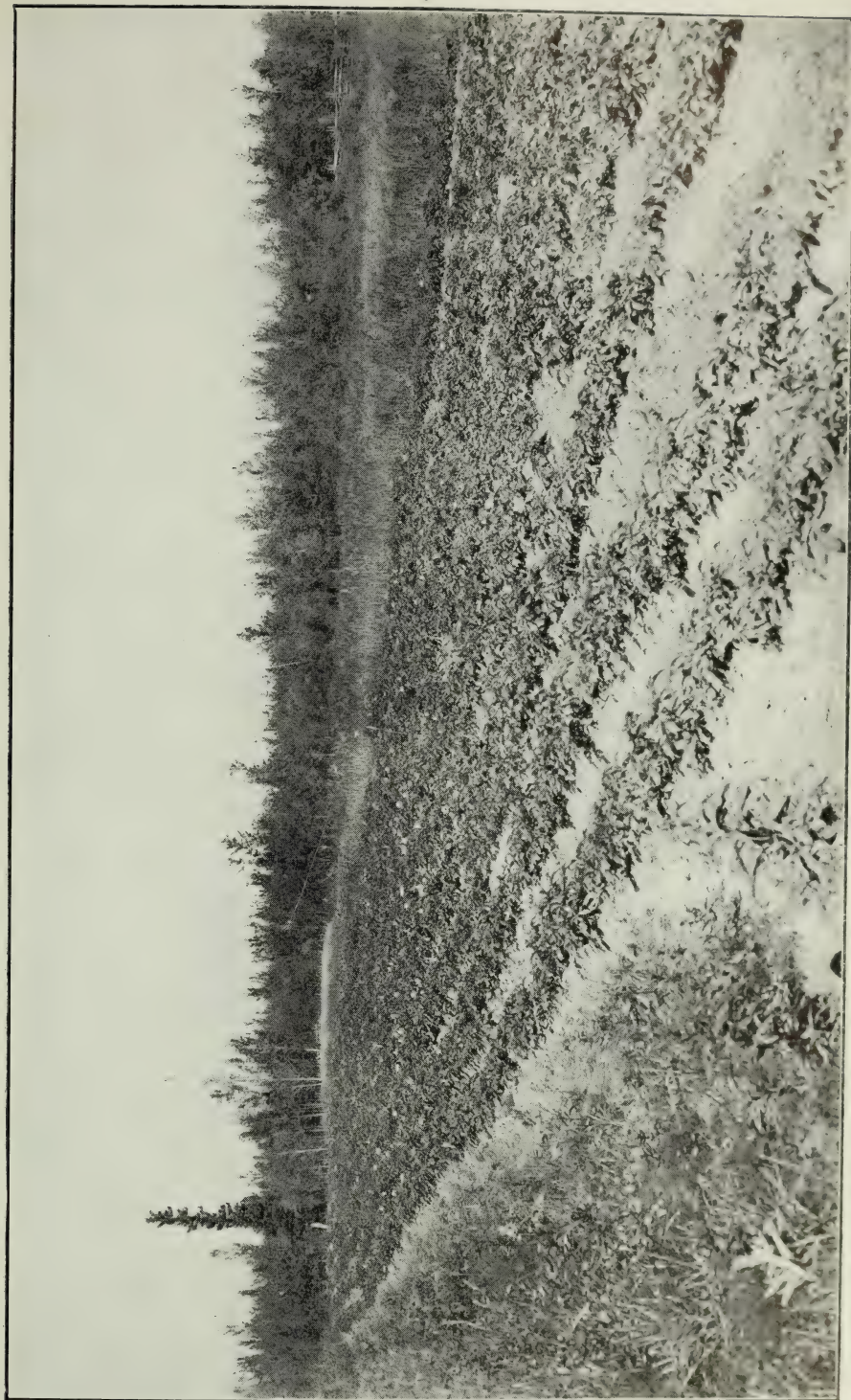
Observing tent at Fort Smith.

Photo by C. Engler, D. L. S.







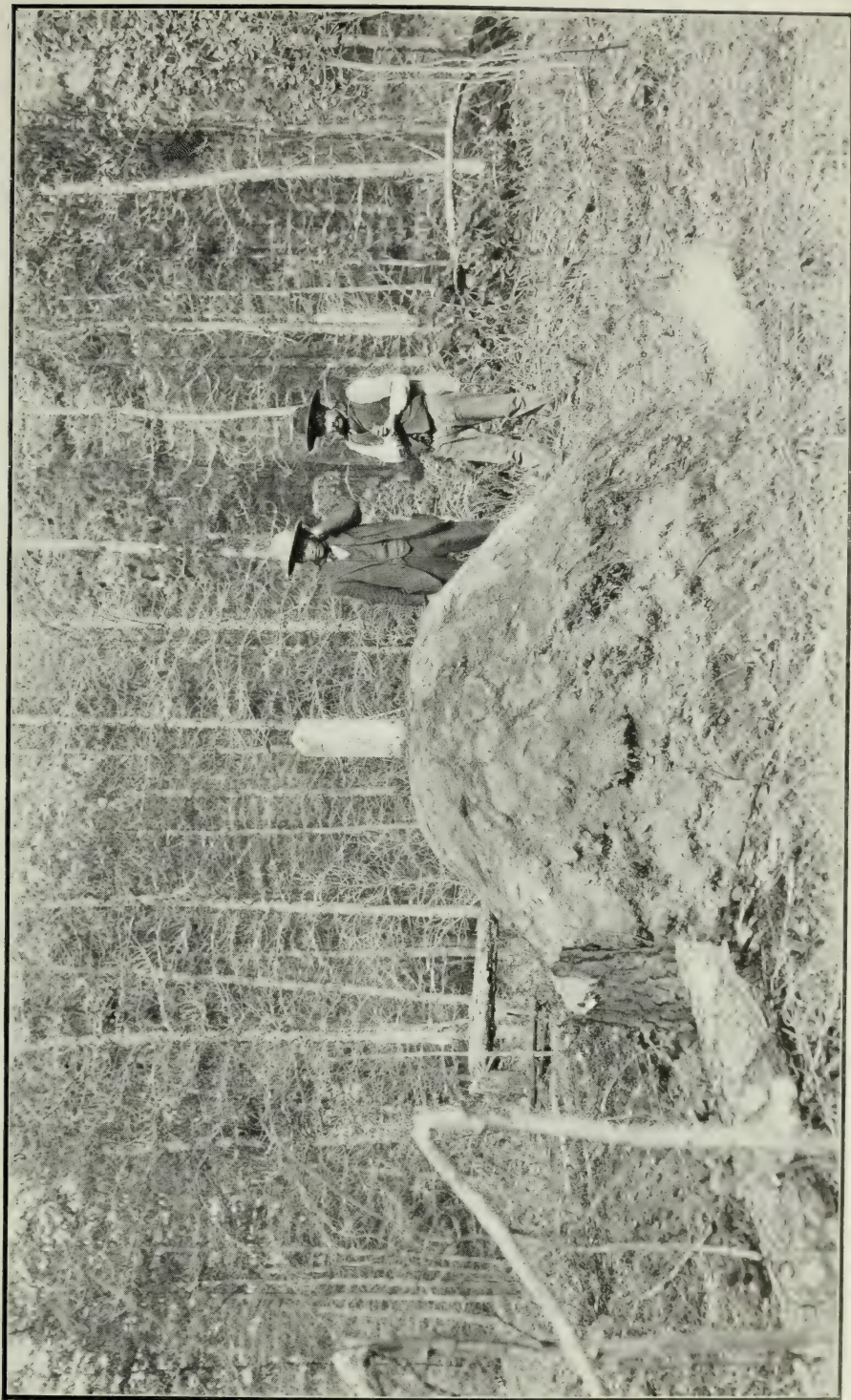


Priest's farm at Fort Smith. Potatoes in foreground. Barley and oats almost ripe in the distance. July 31, 1910. Photo by C. Engler, D. L. S.









Mound and post marking the boundary between Alberta and the Northwest Territory, on the west side of Slave river.  
Photo by C. Enckley, D.L.S.









Prairie near Burnt river.

Photo by A. W. Ponten, D. L. S.







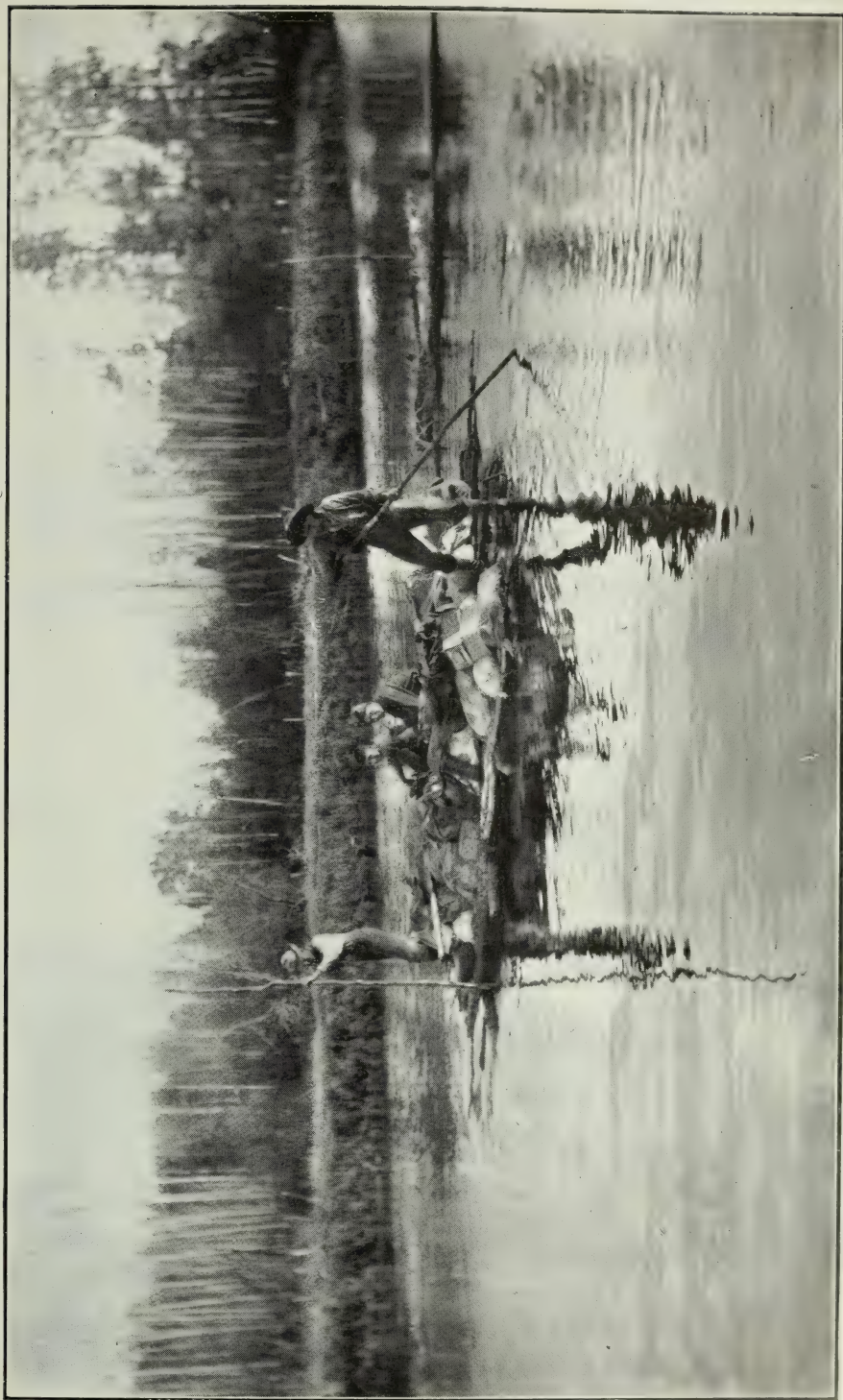


Photo by A. W. Ponton, D. L. S.

Ferrying across Stinking creek.







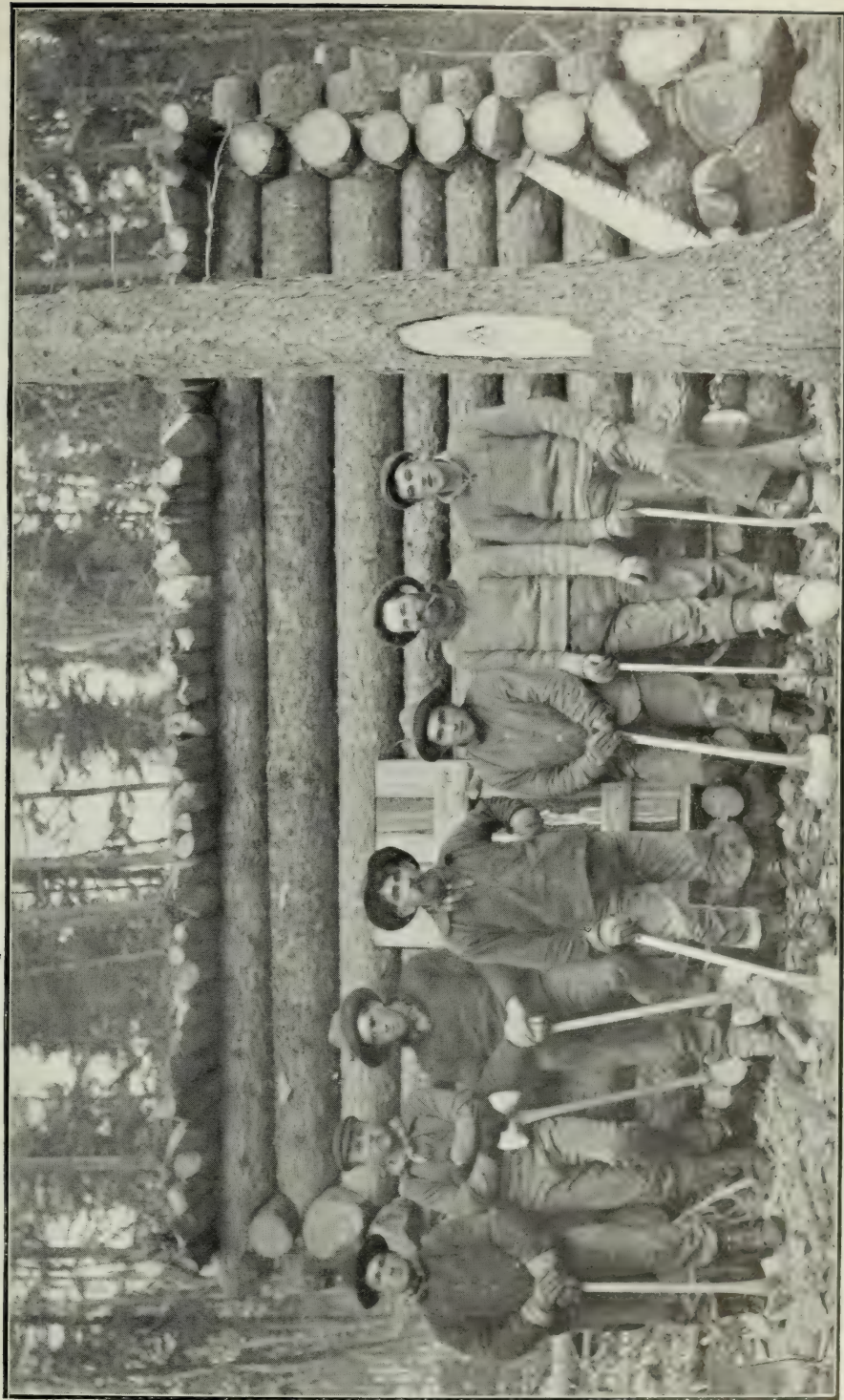


Photo by A. W. Ponton, D.L.S.  
Valley of Panny river—looking south.









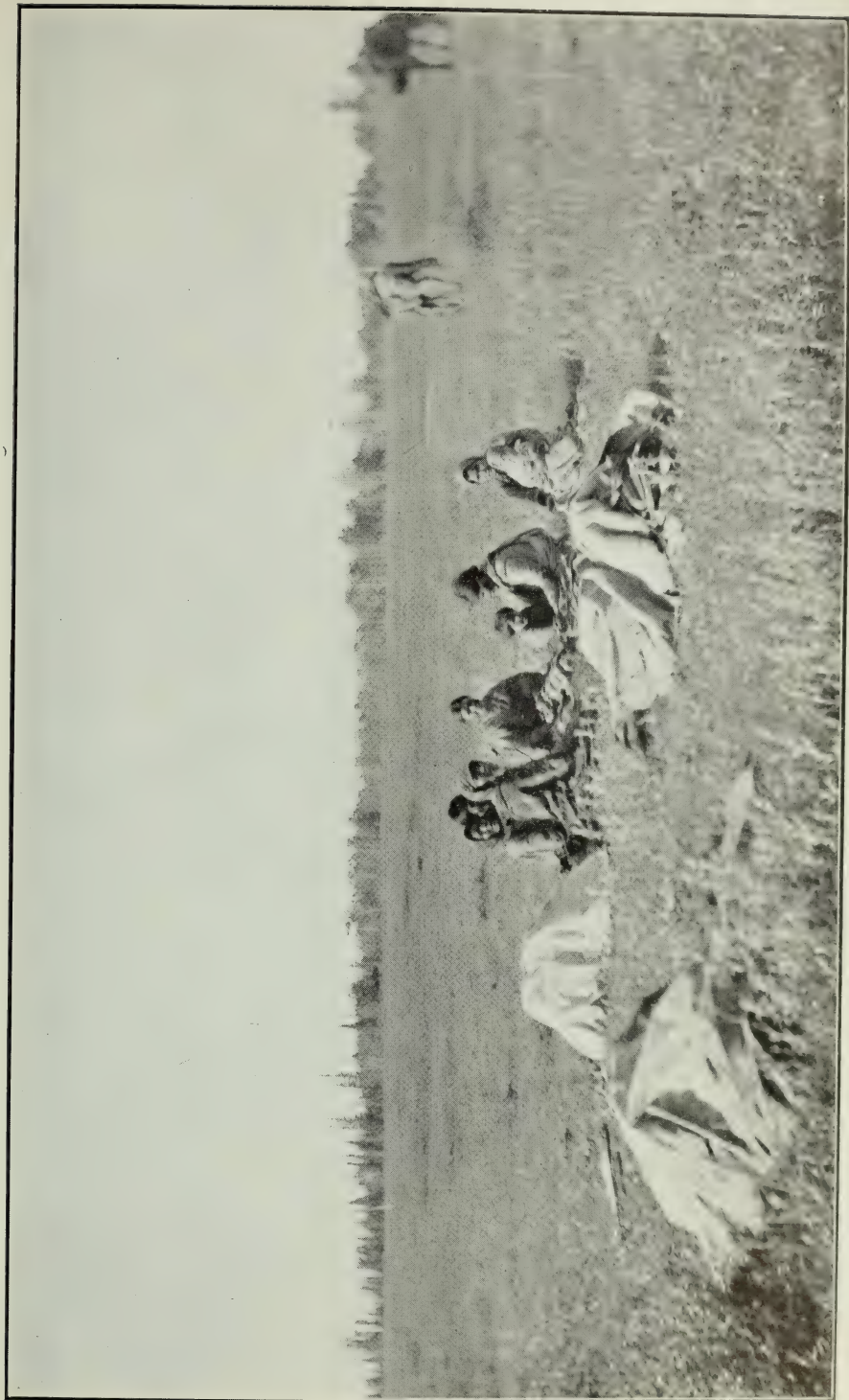
Survey cache—Peace River.

Photo by A. W. Ponton, D. L. S.









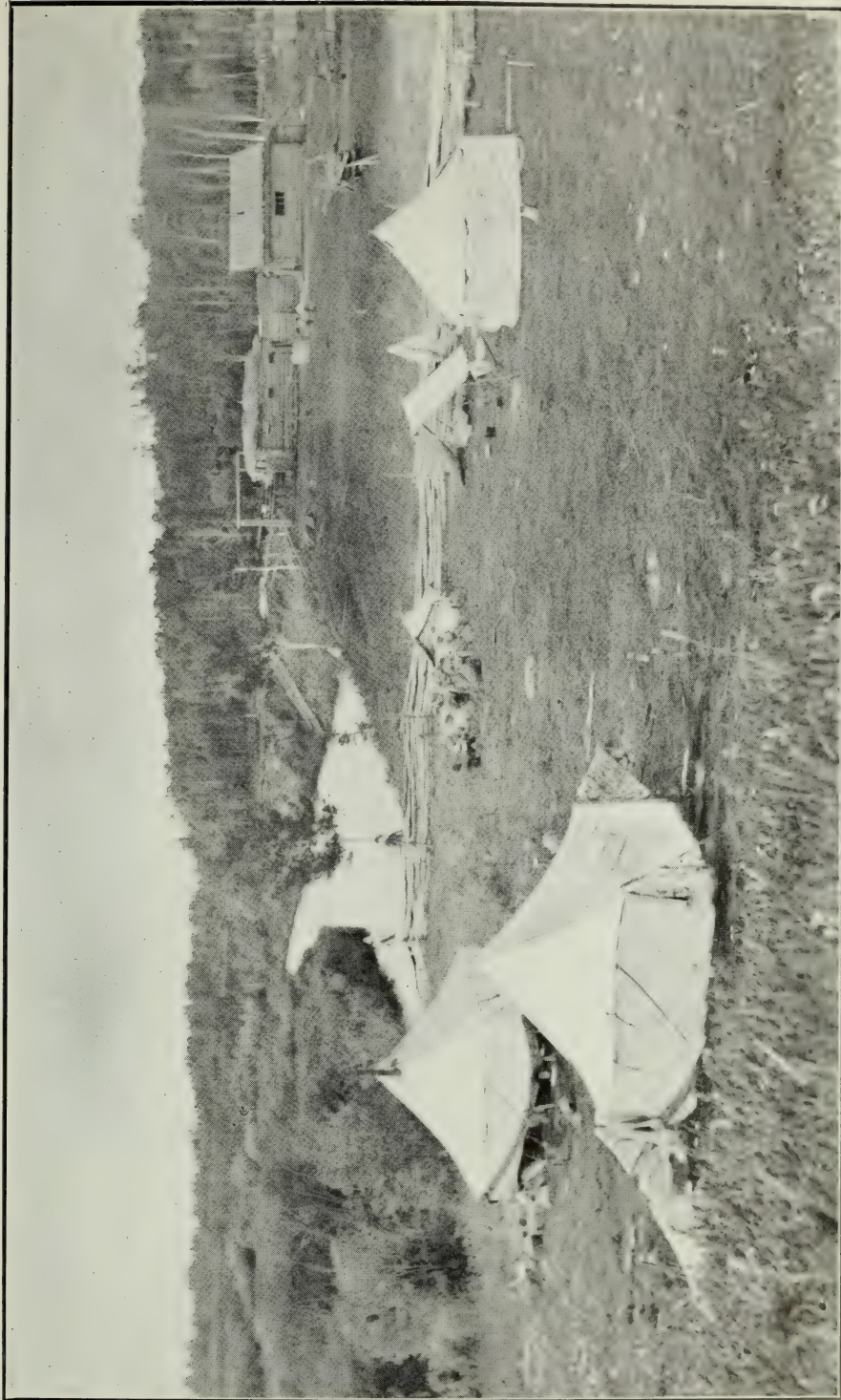
Prairie country, township 108, range 13, west of 5th meridian

Photo by A. W. Ponton, D. L. S.









Clement Paul's ranch on Boyer river. Survey camp in foreground.

Photo by A. W. Ponton, D. L. S.







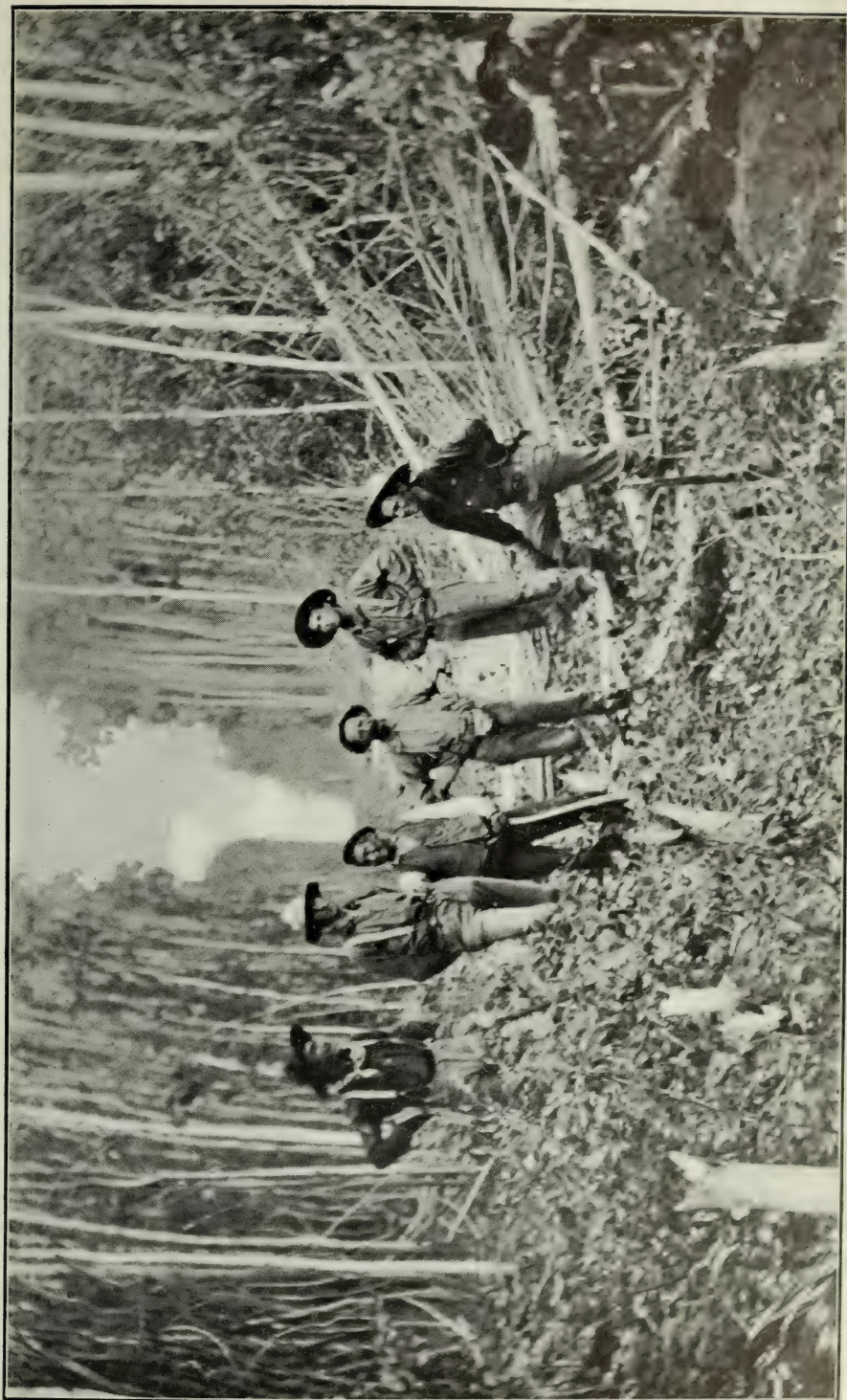


Photo by A. W. Ponton, D. L. S.

Northeast corner township 108, range 18, west of 5th Meridian—Looking east.







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ZINCOGRAPHED AT THE SURVEYOR GENERAL'S OFFICE, OTTAWA, CANADA.

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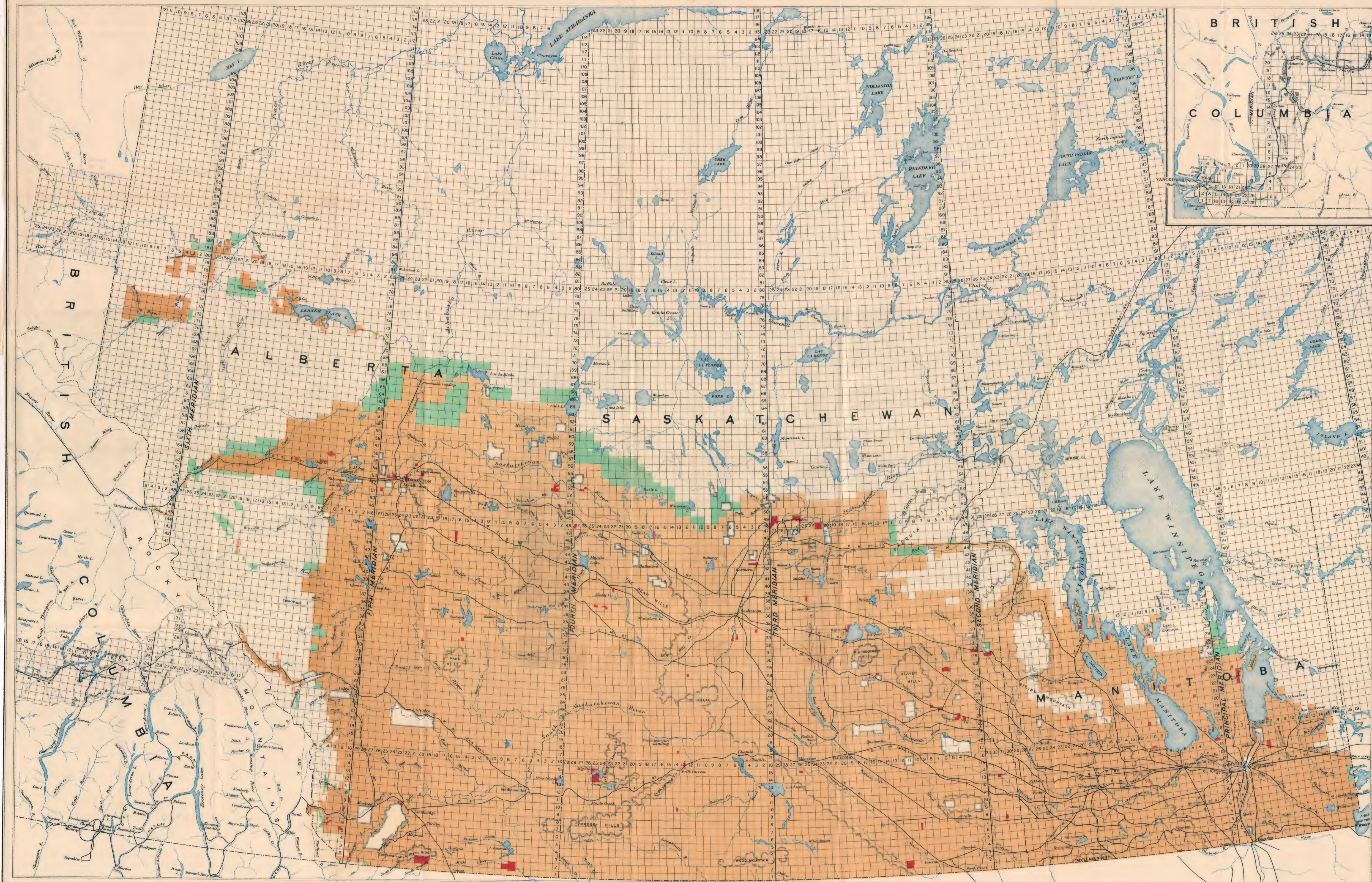


# INDEX TO TOWNSHIPS IN MANITOBA, SASKATCHEWAN, ALBERTA AND BRITISH COLUMBIA

To accompany the annual report of the Topographical Surveys Branch, 1910-1911.

TOPOGRAPHICAL SURVEYS BRANCH, DEPARTMENT OF THE INTERIOR

SCALE 35 MILES TO AN INCH 2:17,680



Subdivision surveys made prior to March 31, 1910.  
 Subdivision surveys made from April 1, 1910 to March 31, 1911.  
 Resurveys made from April 1, 1910 to March 31, 1911.  
 Surveys in the railway belt in British Columbia are not shown, owing to their scattered nature.

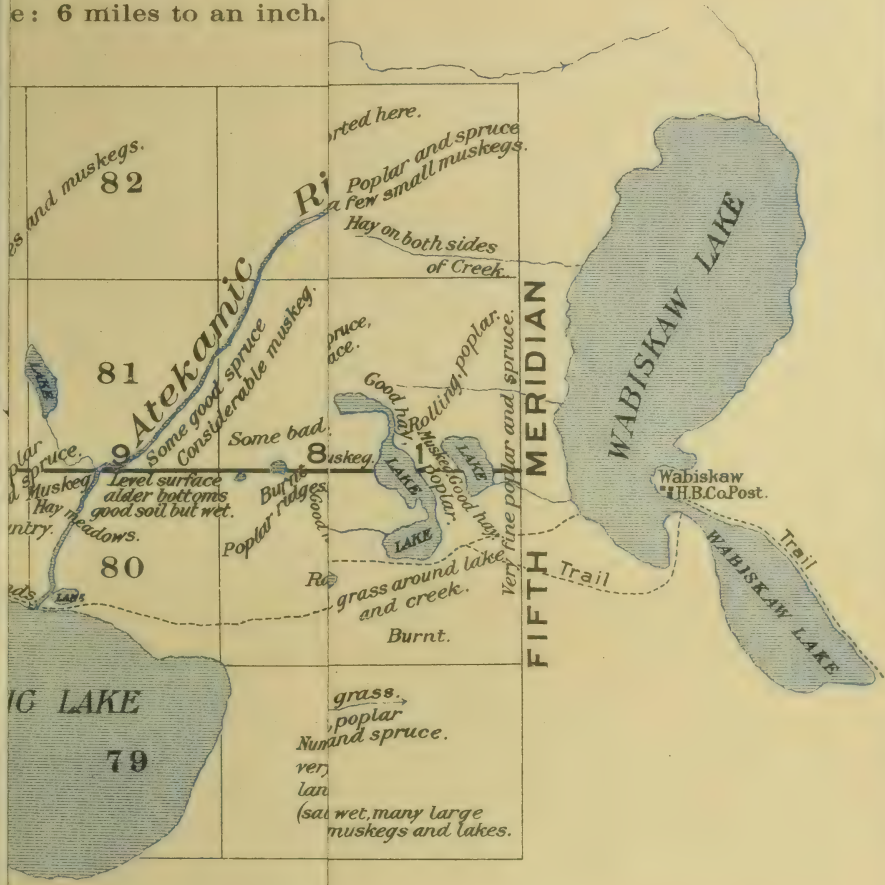
CAUTION:—This is only an index, topographical and other features are not to be depended upon.

ZINCOPHATED AT THE SURVEYOR GENERAL'S OFFICE OTTAWA, CANADA.



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THE TWENTY  
Range 18, West of the  
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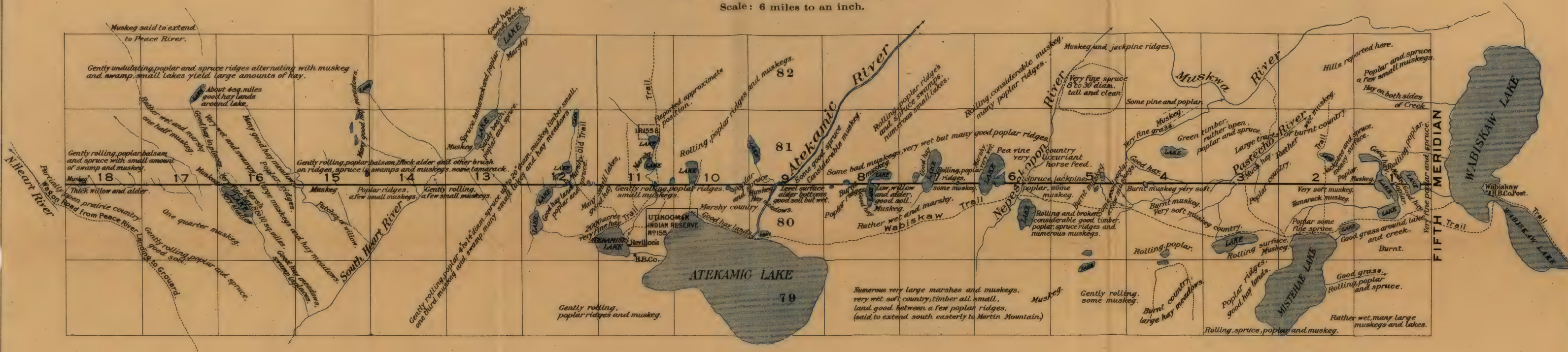
PROFILE

Scale: 1000 feet to an in  
ended to a point 0.20 chains north



# SKETCH MAP SHOWING TOPOGRAPHY OF THE TWENTY-FIRST BASE LINE From Range 1 to Range 18, West of the 5th Meridian PROVINCE OF ALBERTA

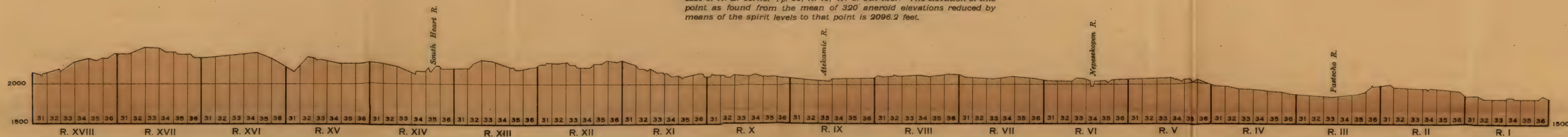
Scale: 6 miles to an inch.



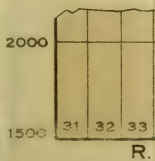
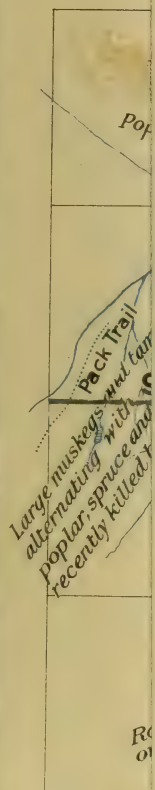
## PROFILE

Vertical Scale: 1000 feet to an inch.

The elevations are all referred to a point 0.20 chains north and 2.32 chains east of N. E. corner Tp. 80, R. 19, W. of 5th Mer. The elevation of this point as found from the mean of 320 aneroid elevations reduced by means of the spirit levels to that point is 2096.2 feet.







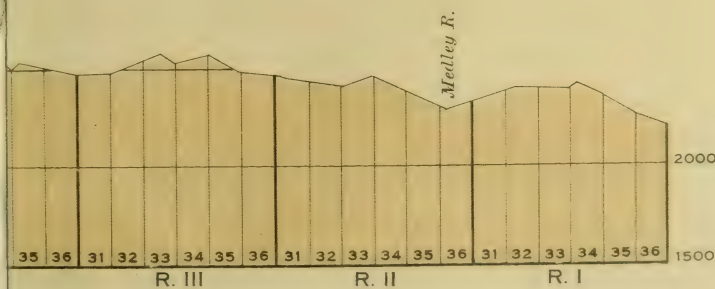


Scale: 6 miles to an inch.



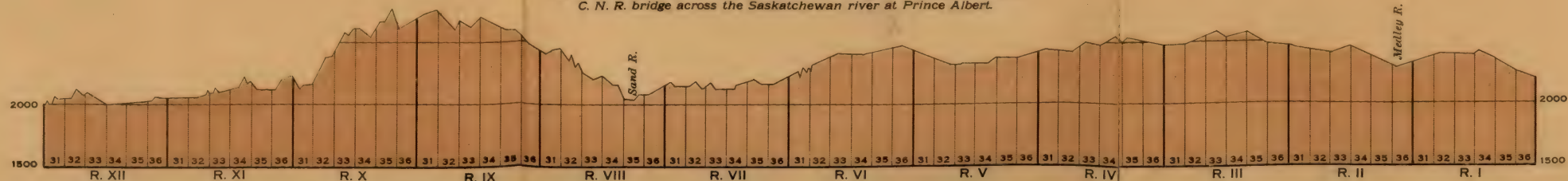


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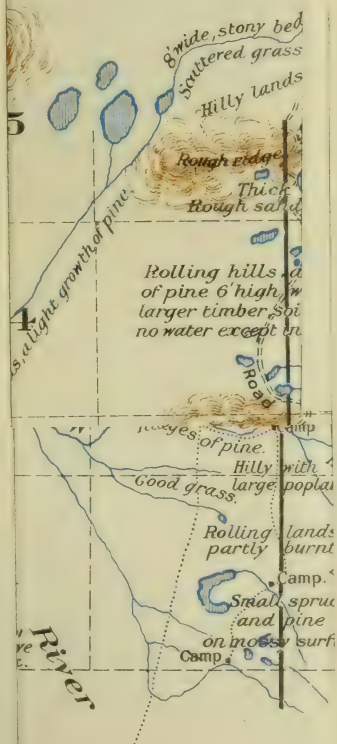


Scale: 6 miles to an inch.





## MERIDIAN





# SKETCH MAP OF PART OF THE FOURTH MERIDIAN

Township 66 to Township 95

Scale: 6 miles to an inch.

PROFILE  
Vertical Scale: 1000 feet to an inch.  
The elevations are referred to a datum of 1489.202 feet at bench mark on C. N. R. bridge across the Saskatchewan river at Prince Albert.

PROFILE  
Vertical Scale: 1000 feet to an inch.  
The elevations are referred to a datum of 1489.202 feet at bench mark on C. N. R. bridge across the Saskatchewan river at Prince Albert.





SKETCH MAP SHOWING TOPOGRAPHY  
ON THE  
NINETEENTH BASE LINE

Across Ranges 1, 2, 3, 4 and 5, West of the 4th Meridian.  
PROVINCE OF ALBERTA.

Scale : 6 miles to an inch.



PROFILE

Vertical Scale : 1000 feet to an inch.

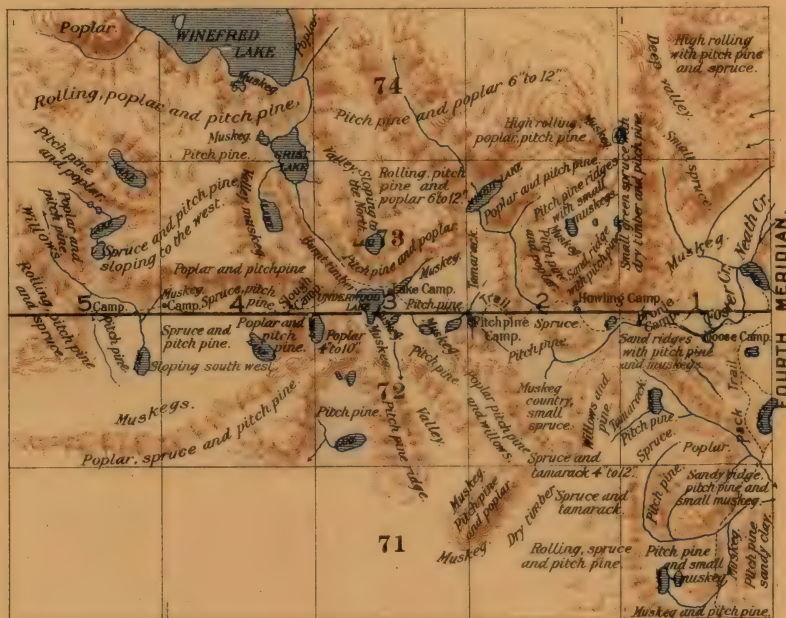
The elevations are referred to a datum of 1489.202 feet at bench mark on  
C. N. R. bridge across the Saskatchewan river at Prince Albert.





Across Ranges 1, 2, 3, 4 and 5, West of the 4th Meridian.  
**PROVINCE OF ALBERTA.**

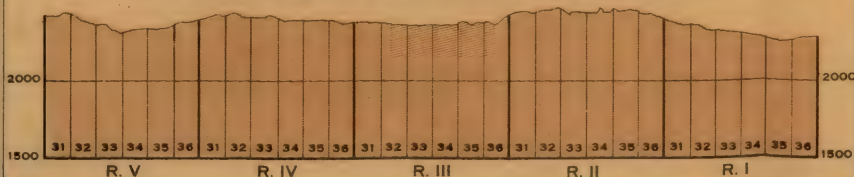
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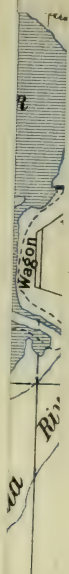
## PROFILE

Vertical Scale: 1000 feet to an inch.

The elevations are referred to a datum of 1489.202 feet at bench mark on C. N. R. bridge across the Saskatchewan river at Prince Albert.



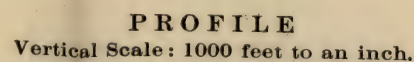
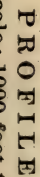
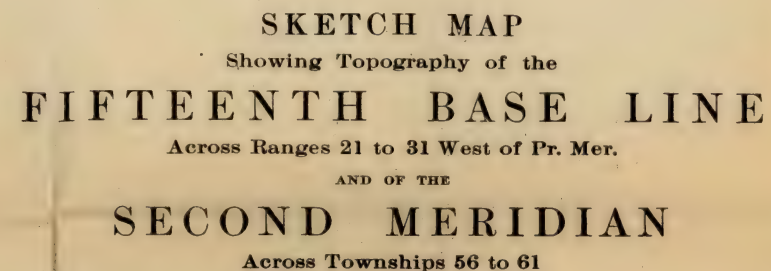




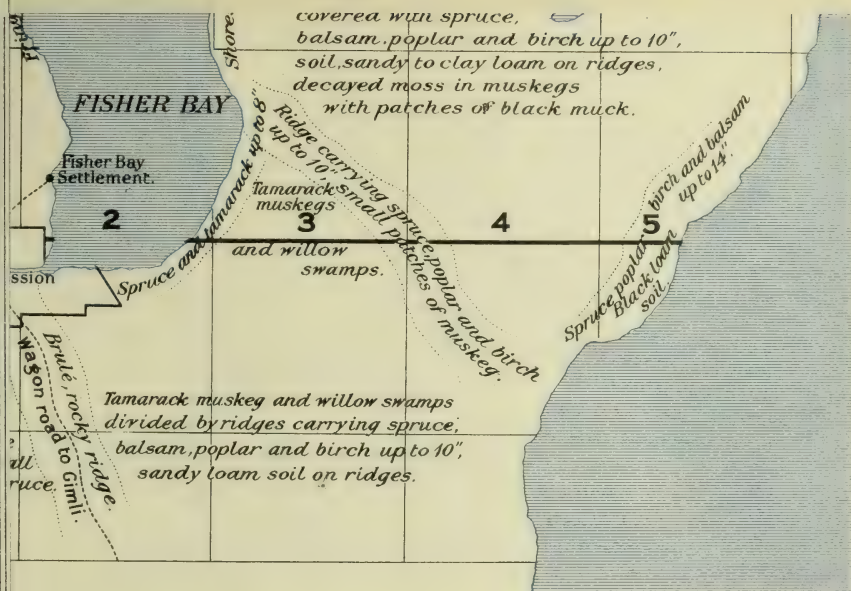
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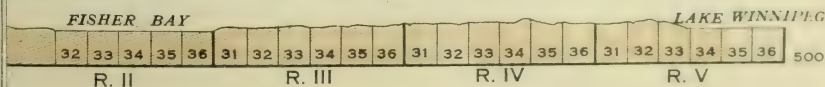




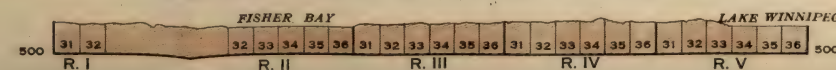
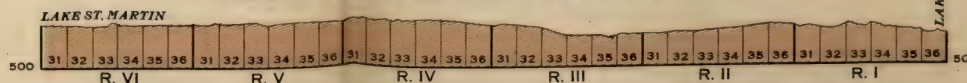
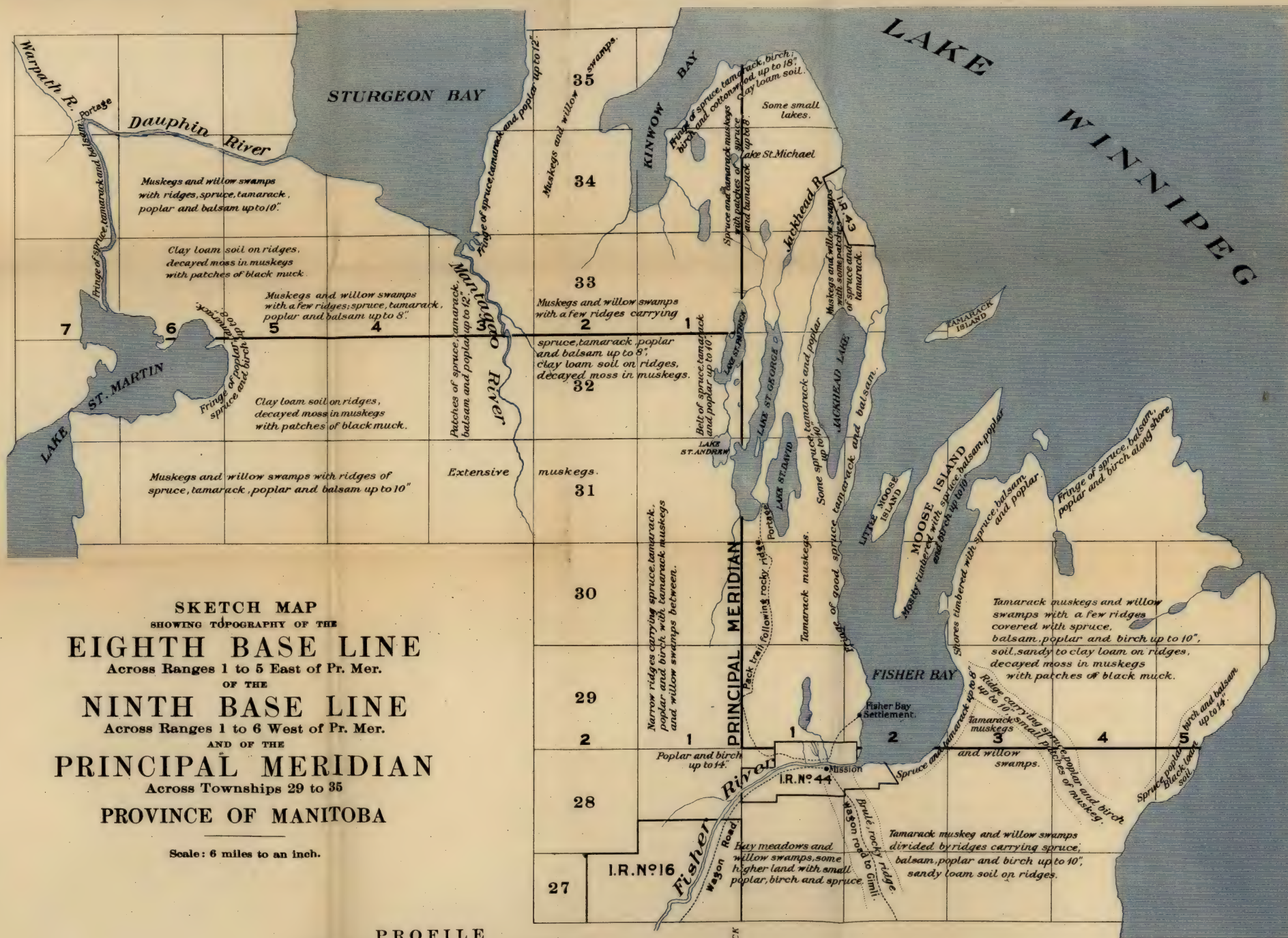
## PROFILE

Vertical Scale: 1000 feet to an inch.

Observations were deduced from simultaneous aneroid readings taken at the N. E. corner of Sec. 36, Tp. 28, R. 1, West of Principal Meridian at Gimli, Manitoba (Elevation 716.95 feet, C. P. R. Survey.)



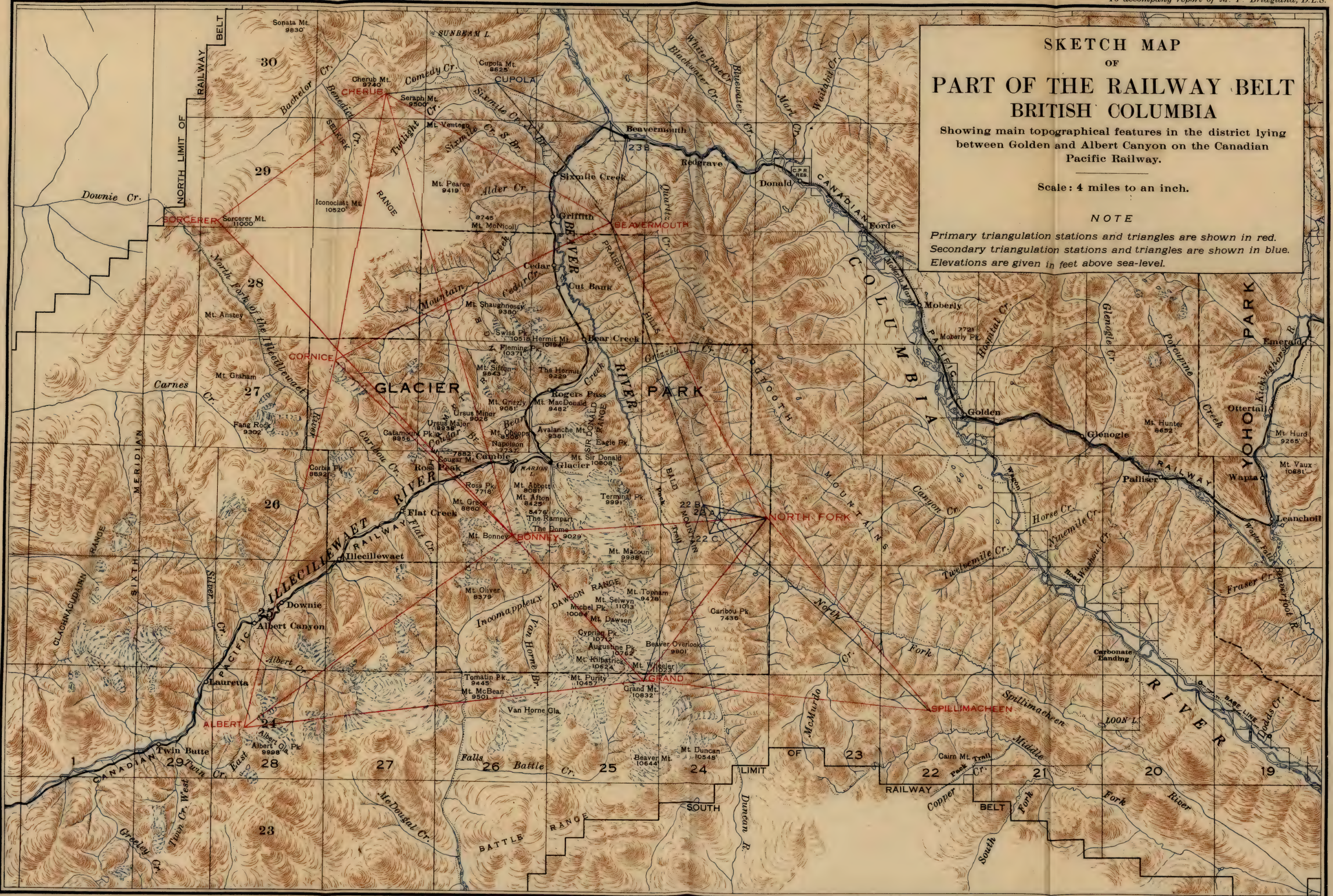












SKETCH MAP  
OF  
PART OF THE RAILWAY BELT  
BRITISH COLUMBIA

Showing main topographical features in the district lying  
between Golden and Albert Canyon on the Canadian  
Pacific Railway.

Scale: 4 miles to an inch.

NOTE

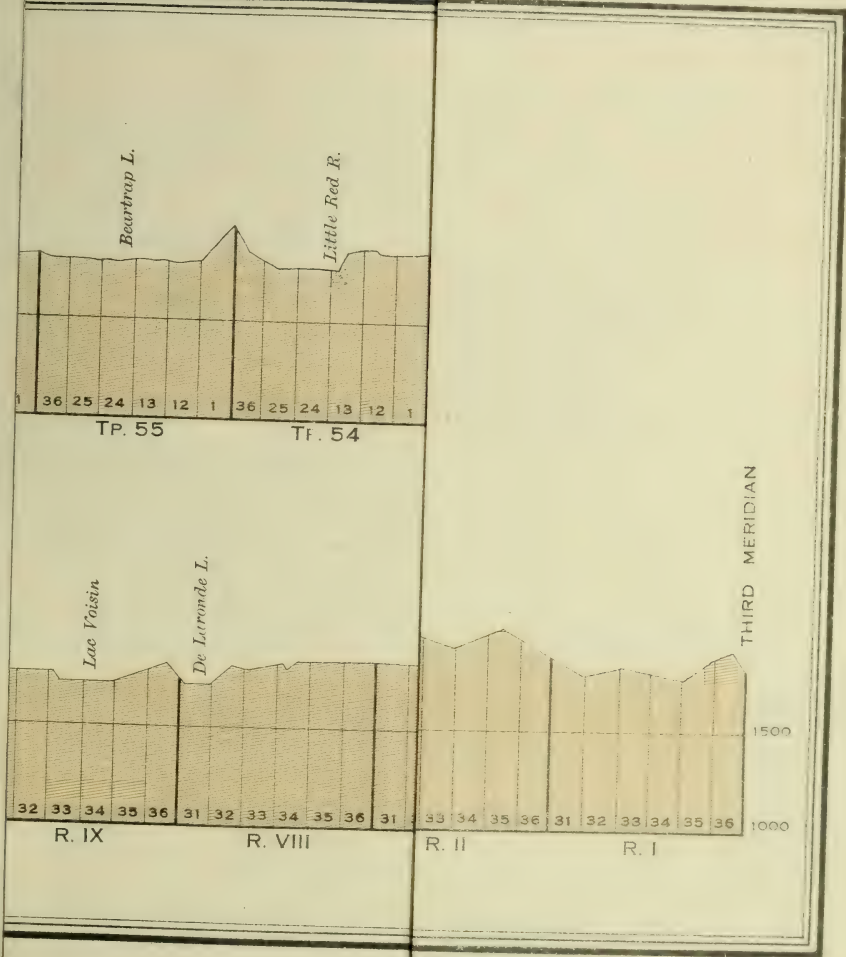
Primary triangulation stations and triangles are shown in red.  
Secondary triangulation stations and triangles are shown in blue.  
Elevations are given in feet above sea-level.



DEPARTMENT OF THE INTERIOR

10

company report of A. Saint Cyr, D.L.S.



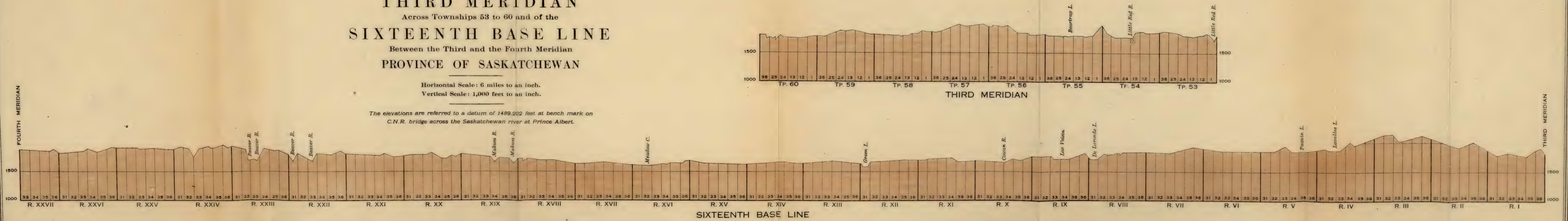
AT THE SURVEYOR GENERAL'S OFFICE, OTTAWA, CANADA



PROFILE  
OF THE  
THIRD MERIDIAN  
Across Townships 53 to 60 and of the  
SIXTEENTH BASE LINE  
Between the Third and the Fourth Meridian  
PROVINCE OF SASKATCHEWAN

Horizontal Scale: 6 miles to an inch.  
Vertical Scale: 1,000 feet to an inch.

The elevations are referred to a datum of 1489.202 feet at bench mark on  
C.N.R. bridge across the Saskatchewan river at Prince Albert.





DEPARTMENT OF THE INTERIOR

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ANNUAL REPORT

OF THE

TOPOGRAPHICAL SURVEYS  
BRANCH

1911 - 1912

*PRINTED BY ORDER OF PARLIAMENT.*



OTTAWA

PRINTED BY C. H. PARMELEE, PRINTER TO THE KING'S MOST  
EXCELLENT MAJESTY

1913







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REPORT  
OF THE  
SURVEYOR GENERAL OF DOMINION LANDS  
1911-1912

DEPARTMENT OF THE INTERIOR,  
TOPOGRAPHICAL SURVEYS BRANCH,  
OTTAWA, August 14, 1912.

The Deputy Minister of the Interior,  
Ottawa.

SIR,—I have the honour to submit the following report of the Topographical Surveys Branch for the year ended March 31, 1912.

Surveys were continued throughout the year in the western provinces, and subdivision was extended northerly into the Peace River block. Seventy-six parties were employed but only seventy-three of these worked the whole season, three parties being engaged for a short time only. The surveyors working under contract numbered thirty-four and were engaged on subdivision and timber berth surveys while the forty-two employed by the day were engaged on subdivision, resurvey and miscellaneous work of various kinds.

The spring and early summer of 1911 was abnormally wet and was the cause of much delay as surveyors had much difficulty in reaching the scene of operations. The surveyors report that the continued wet weather affected the proper ripening of the grain and that some low grade wheat was produced by being cut before it was properly ripened in order to escape frost.

The following statement shows the average number of miles of survey for each party during the last four years:—

1908.....	366 miles.
1909.....	412 “
1910.....	279 “
1911.....	280 “

One hundred and sixty-six whole townships and eight fractional townships were completely subdivided while a partial subdivision was made of three hundred and thirty others, and a resurvey either partial or complete was made of two hundred and twenty-five others.

The distribution of these parties by provinces is shown in the following table:—

Parties.	In Manitoba.	In Saskatchewan.	In Alberta.	In British Columbia.	Partly in one province and partly in another.	Total.
Paid by the day.....	3	3	12	6	15	39
Under contract.....	3	16	13	—	2	34
Parties engaged for a short time only.....	1	—	—	1	1	3
Totals.....	7	19	25	7	18	76



## SURVEY OF BLOCK OUTLINES.

Seven surveyors were employed in running base lines and initial meridians in Manitoba, Saskatchewan and Alberta while three others were similarly employed in the Peace River block.

Mr. T. H. Plunkett, D.L.S., completed the survey, levels and building of mounds along portions of the fifth meridian and the twenty-eighth and twenty-ninth base lines west of the fifth meridian. These lines were run in 1910 by Mr. A. W. Ponton, D.L.S., but the ground was so wet that mounds could not be built. Mr. Plunkett reports last season's rains as being the heaviest in twenty years, but he succeeded in getting the low-lying portions of the lines mounded before the heavy rains set in.

The twenty-second base line was run west from the fifth meridian one hundred and twenty miles by Mr. A. H. Hawkins, D.L.S. He lost twenty days through wet weather and reports rain on ninety days out of one hundred and fifty-eight. The base line runs through fairly level country which has been overrun by fire and could be cultivated without very much expense in clearing. No hills over one hundred feet high were encountered on the line.

Mr. G. H. Blanchet, D.L.S., ran the twenty-third base line from the fourth to the fifth meridian. Upon the completion of this work he moved directly to the nineteenth base line between the same meridians and began the production of this line west from range 5.

Latitude observations were taken on the principal meridian and on the fourth meridian by Mr. J. A. Fletcher, D.L.S. The correct survey of the initial meridians is of the utmost importance as it is from these the base lines, which govern the township subdivision, are run. The southern portions of the meridians were run a number of years ago when the degree of accuracy under which work at the present time is done, could not be obtained by surveyors with the equipment at their disposal. Latitude observations were, therefore, necessary to detect and correct errors which might have occurred in the original surveys. Observations were taken at two places on the principal meridian, on the north shore of lake Winnipeg in township 48 and on the south shore in township 35. On the fourth meridian observations were also taken at two places in township 89 at the crossing of Clearwater river and in township 62 on the south shore of Cold lake.

Part of the seventeenth base line west of the third meridian was run by Mr. A. Saint Cyr, D.L.S. He also made a restoration survey of part of the fourth meridian south to the sixteenth base as the end of the seventeenth base fell in Cold lake and closing had to be effected on the adjoining base line. The country crossed by the seventeenth base line is fairly well wooded east of the crossing of Beaver river, but west from the river it is low and swampy.

Mr. E. W. Robinson, D.L.S., surveyed a portion of the second meridian and ran a portion of the fifteenth base line westerly therefrom. Along the second meridian the land is low and swampy while muskegs are numerous. They have, however, a hardpan bottom and none of them are of the floating variety. Although the temperature was at 80° Fahr. frost was encountered when digging the pits as the dry mossy surface absorbs the heat and acts as a very efficient non-conductor. With cultivation and drainage, however, this disadvantage will doubtless disappear.

Mr. A. W. Ponton, D.L.S., surveyed the principal meridian from the thirteenth to the sixteenth base line. He reports the country through which the line runs to be low, wet and swampy, with occasional outcroppings of rock. The surface, though mostly covered with trees of small dimensions is composed of black vegetable muck unsuited to agriculture.

Portions of the fourth meridian and of the twenty-fourth base line westerly therefrom were run by Mr. J. B. McFarlane, D.L.S. The fourth meridian was produced north to township 103. From township 95 north the soil is nine-tenths sandy with



## SESSIONAL PAPER No. 25b

jackpine and small muskegs. Fires sweep over this district about once every decade as the muskegs are not large enough to stop them. The country is not adapted to agriculture on account of the sandy nature of the soil, and rain, though fairly plentiful, falls generally in small drizzly showers.

## SURVEYS IN THE PEACE RIVER BLOCK.

The Peace River block is a rectangular tract of land containing 3,500,000 acres. It is situated in British Columbia adjoining the Province of Alberta and was granted to the Dominion by the Province of British Columbia in exchange for land in the railway belt which had been disposed of by the province before the belt was placed under Dominion control. It was selected after an exploration by Messrs. J. A. Macdonell and J. A. Belleau in 1905-06, but the outlines had never been run to define its exact location. The survey of these outlines was a somewhat difficult undertaking.

During the past season four surveyors, Messrs. J. R. Akins, D.L.S., Geo. McMillan, D.L.S., O. Rolfson, D.L.S., and L. Brenot, D.L.S., were employed in outlining the block and running base lines across it.

Mr. Akins ran the north boundary and assisted Mr. Brenot to complete the west boundary. He experienced great difficulties in transportation as the snow was deep till late in the spring. Unless a surveyor is on the ground early he cannot accomplish much work, the summer season being short in these high latitudes.

Mr. McMillan ran the twenty-first base west across the block. He was assisted on the western portion by Mr. Brenot and on reaching the western boundary Mr. McMillan ran the portion south to the southwest corner of the block while Mr. Brenot ran the portion north. Mr. McMillan had set out for the survey of the base line as early as February and he experienced some very cold weather, the thermometer registering as low as  $-55^{\circ}$  Fahr. but towards the end of March the weather moderated sufficiently to allow of the commencement of operations.

Mr. Rolfson ran the twenty-second base line across the block. He also experienced much difficulty in the transportation of supplies as the ice on Peace river west of Dunvegan was not strong enough to carry freighters owing to the swift current in the river. The country crossed by the base line is fairly well wooded although there are occasional open patches of scrubby prairie.

A report on the surveys in the Peace River district containing a description of the country, surveyors' reports on townships and general information has been published in pamphlet form.

## INSPECTION OF CONTRACT SURVEYS.

Surveys which are executed under contract must pass a rigid examination before being accepted. Five inspection parties under Messrs. P. R. A. Belanger, D.L.S., C. F. Miles, D.L.S., E. W. Hubbell, D.L.S., L. E. Fontaine, D.L.S., and G. J. Lonergan, D.L.S., were employed on inspection work during the past season. They also performed small miscellaneous surveys which happened to be in the vicinity of their work. It may be worthy of note that it was necessary to send an inspector into the Peace River district for the first time, to examine contract surveys. This shows at what a rapid rate settlement is advancing. Some of the townships inspected lie over 300 miles from the nearest railway.

Mr. Belanger inspected contract surveys in Manitoba and made some subdivision and traverse surveys at Pointe du Bois on Winnipeg river. He also surveyed a small settlement at Fisher Bay, the lots of which are all occupied by half-breed fishermen.



3 GEORGE V., A. 1913

The inspection of contracts in Saskatchewan was done by Messrs. Miles and Hubbell, in the northwestern and north central portions respectively. Mr. Miles also made several miscellaneous surveys in the vicinity of his inspection work and subdivided a portion of the Cold Lake Indian reserve which was transferred to this Department by the Department of Indian Affairs.

Messrs. Fontaine and Lonergan were employed on inspection work in western and northwestern Alberta respectively. Mr. Lonergan's work extended into the Peace River district as twenty-eight townships were subdivided there under contract last year.

#### BRITISH COLUMBIA SURVEYS.

Surveys in the railway belt were continued under Messrs. W. J. Deans, D.L.S., J. E. Ross, D.L.S., C. H. Taggart, D.L.S., A. Lighthall, D.L.S., and A. V. Chase, D.L.S.

Mr. Deans completed several miscellaneous surveys and traverses; he also surveyed a number of timber berths north of Vancouver.

Mr. Ross subdivided land in the district south of Kamloops, while Mr. Taggart was employed on miscellaneous surveys north of Kamloops.

Mr. Lighthall did some levelling at Woodhaven on Bedwell bay in order to determine if the slopes would permit of changing the courses of some of the roads. He was also engaged on subdivision survey, timber berth survey and delimitation of a portion of the railway belt.

The examination of vacant lands in the Kamloops district, for purposes of classification into fruit land, farming land, grazing land, timber land and worthless land was continued by Mr. Chase. He also performed some miscellaneous subdivision in the vicinity of Lytton.

#### TOWNSHIP SUBDIVISION SURVEYS.

Subdivision surveys which were carried on in five hundred and four townships were executed by surveyors working under contract and also by some surveyors working under daily pay in localities where contract rates would not apply.

Some miscellaneous subdivision at Le Pas in northern Manitoba was done by Mr. A. L. MacLennan, D.L.S. He also surveyed a booming site on Carrot river applied for by the Finger Lumber Co.

Messrs. W. A. Scott, D.L.S., and J. Francis, D.L.S., were engaged on miscellaneous subdivision and surveys of coal claims in southwestern Alberta.

Mr. C. M. Walker, D.L.S., made a survey of land required for power purposes on Elbow river and subdivided portions of townships in southwestern Alberta.

Subdivision of lands through which the Alberta Coal branch of the Grand Trunk Pacific railway runs and surveys of coal claims in the same vicinity were made by Mr. A. L. McNaughton, D.L.S.

#### CORRECTION, RESTORATION AND MISCELLANEOUS SURVEYS.

Mr. A. L. Cumming, D.L.S., retraced two townships in the Cypress hills in order to determine the true bearings of the lines and to renew the monuments, replacing the old wooden posts by iron posts. He also made several small miscellaneous surveys in southern Alberta.

Mr. P. B. Street, D.L.S., subdivided some lands in the foot-hills of the Rocky mountains in southwestern Alberta in order to enable the Department to dispose of some coal lands and mineral claims near Pincher Creek. He also made several miscellaneous surveys in this vicinity and traversed a portion of Icelandic river in eastern Manitoba.



## SESSIONAL PAPER No. 25b

A correction survey of several townships in central Alberta was done by Mr. H. Matheson, D.L.S. These townships were partly subdivided under contract in 1908, and owing to difficulties in securing supplies the contractor did not complete the subdivision. Although the contractor was requested to return and finish the work, it was never satisfactorily done and Mr. Matheson was instructed to complete it.

Mr. C. F. Aylsworth made a subdivision into lots of the land around Max lake in Turtle Mountain forest reserve and Fish lake in Moose Mountain forest reserve for summer resort purposes.

Mr. C. Rinfret, D.L.S., destroyed duplicate monuments in a number of townships subdivided in 1883 in the vicinity of Moosejaw. He also resurveyed some townships near Maple Creek and towards the close of the season performed a number of miscellaneous scattered surveys.

Messrs. G. A. Bennett, D.L.S., E. S. Martindale, D.L.S., and R. C. Purser, D.L.S., were engaged on miscellaneous scattered resurveys, correction surveys, traverses and investigation of reported errors in Manitoba, Saskatchewan and Alberta.

Settlement surveys were made by Mr. H. S. Day, D.L.S., along the Athabaska at Pelican, Grand Rapids, McMurray, McKay and Chipewyan.

Mr. P. A. Carson, D.L.S., made a stadia traverse of a portion of North Lillooet river.

Mr. A. W. Ashton, D.L.S., surveyed a cemetery site near Blairmore and also performed some miscellaneous surveys near Lytton.

An investigation of old surveys near Deloraine which was urgently required was made by Mr. T. S. Nash, D.L.S., of the office staff.

Messrs. W. T. Thompson, D.L.S., and H. K. Moberly, D.L.S., were employed on the survey of timber berths.

The easterly portion of the triangulation survey in the railway belt was retraced by Mr. M. P. Bridgland, D.L.S. He renewed the monument at station I on the fifth meridian, erected by Mr. W. S. Drewry, D.L.S., in 1890, and re-established all the stations westerly to the summit of the Rockies. He also connected the triangulation with the monuments of the Dominion Lands system, wherever possible, and, although he failed to locate the monuments on the sixth meridian, as they had been destroyed by fire and lumbering operations, he found the nearest existing monument two miles farther west and tied it to the triangulation. A thoroughly reliable tie has thus been established by means of the triangulation between the fifth and sixth meridians. Mr. Bridgland also investigated surveys west of Calgary.

Mr. J. N. Wallace, D.L.S., who is in charge of levelling operations ran lines northerly from Prince Albert and Lloydminster. This survey was necessary to connect the levels already taken along the third and fourth meridians and adjoining base lines with the elevations along the railway which are at present the only available source of information in the western provinces regarding sea-level. The line of levels run northerly from Prince Albert is thirty miles while that northerly from Lloydminster is eighty-three miles.

## YUKON SURVEYS.

Mr. F. H. Kitto, D.L.S., a member of the Topographical Surveys staff at Ottawa, was sent to Dawson to take charge of the survey office of the Yukon Territory upon the resignation of the former director.

Under the direction of the Commissioner of the Yukon Territory, Mr. Kitto undertook the reorganization of that office, in addition to the routine work which consists of giving information to the public, making blue-prints, tracings and sketches, mounting maps, writing descriptions, correspondence, examining and filing of plans and field notes.



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At the request of the Commissioner, group lots and placer claims were surveyed by Mr. Kitto, and the revenue derived therefrom was transferred to the revenue of the Yukon Territory.

Alterations were made in the layout of the office and the lighting overhauled and improved.

In addition to the routine and reorganization work of the office, Mr. Kitto carried on a triangulation survey from Dawson up Klondike river about thirty miles. He also spent eighteen days in the field looking up various locations of trails, base lines and lot posts, for the information of the Territorial and Gold Offices.

Mr. H. G. Dickson, D.L.S., completed his survey under contract of the Carmack's reference traverse from the Nordenskiöld valley to Jarvis creek in the Kluane District.

The staff of the Dawson office consists of three draughtsmen.

#### PHOTO-TOPOGRAPHIC SURVEYS.

Mr. Arthur O. Wheeler, who was formerly topographer on the surveys staff and is now director of the Alpine Club of Canada, made a photo-topographic survey of Mount Robson and the mountains of the continental divide north of the Yellowhead pass on the Grand Trunk Pacific railway. This survey was undertaken for the Grand Trunk Pacific Railway Co., the British Columbia and Alberta Governments and the Alpine Club. Mr. Wheeler offered to place the results of the survey at the disposal of the Department of the Interior provided the Department would assist by the loan of surveying instruments, by furnishing, developing and printing the photographic plates and by preparing the map for photo-lithography. The map, which contains much valuable information, obtained at a trifling cost, on a region hitherto unexplored, accompanies this report.

#### STATEMENT OF MILEAGE SURVEYED.

The following is a comparison of the mileage surveyed each year since 1909:—

Nature of Survey.	April 1, 1909, to March 31, 1910.	April 1, 1910, to March 31, 1911.	April 1, 1911, to March 31, 1912.
	Miles.	Miles.	Miles.
Township outlines.....	2,089	2,376	2,041
Section lines.....	16,326	11,849	10,098
Traverse.....	2,413	2,758	2,577
Resurvey.....	3,876	906	2,317
Total for season.....	24,704	17,889	17,033
Number of parties.....	60	64	61
Average miles per party.....	412	279	280

The following tables show the mileage surveyed by the parties under daily pay and by the parties under contract:—



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## WORK OF PARTIES UNDER DAILY PAY.

Nature of Survey.	April 1, 1909, to March 31, 1910.	April 1, 1910, to March 31, 1911.	April 1, 1911, to March 31, 1912.
	Miles.	Miles.	Miles.
Township outlines.....	861	1,178	992
Section lines.....	1,066	1,487	823
Traverse.....	1,324	462	498
Resurvey.....	3,808	835	2,237
Total for season.....	7,059	3,962	4,550
Number of parties.....	34	30	29
Average miles per party.....	208	132	157

## WORK OF PARTIES UNDER CONTRACT.

Nature of Survey.	April 1, 1909, to March 31, 1910.	April 1, 1910, to March 31, 1911.	April 1, 1911, to March 31, 1912.
	Miles.	Miles.	Miles.
Township outlines.....	1,228	1,198	1,049
Section lines.....	15,260	10,362	9,275
Traverse.....	1,089	2,296	2,079
Resurvey.....	68	71	80
Total for season.....	17,645	13,927	12,483
Number of parties.....	26	34	32
Average miles per party.....	679	410	390

Owing to the nature of their work, fifteen parties are not included in the statement of mileage for the year ended March 31, 1912.

## COST OF SURVEYS.

The following statement shows the average cost per mile of surveys executed by surveyors under daily pay and by surveyors under contract:—

	Surveyed under daily pay.	Surveyed under contract.
Total mileage surveyed.....	4,550	12,483
Total cost.....	\$380,943	\$334,304
Average cost per mile.....	\$83.72	\$26.78



## RECIPROCITY AMONG SURVEYORS.

As the outcome of a conference of surveyors held in Melbourne in 1892, the examination of land surveyors in New Zealand and in the several States of Australia is conducted by a common examining board and the surveyors who are admitted have the right to practise their profession in all parts of Australia and New Zealand.

In 1900, a formal invitation was received from the New Zealand Institute of Surveyors to join in this arrangement on behalf of Canada. Some correspondence was also exchanged with the Surveyor General of New Zealand on the same subject. It was explained to them that the surveyors of each Canadian province had formed associations which were incorporated by the provincial legislatures, and that there was no reciprocity among these different bodies. There was little prospect of joining Australia and New Zealand in reciprocal arrangements before such arrangements were made between the several Canadian associations.

At the Colonial conference of 1907, a motion was submitted by the Governor of New Zealand for establishing reciprocity among land surveyors throughout the Empire. The motion was discussed and adopted after amendment. It states that it is desirable that reciprocity should be established and commends it to the favourable consideration of the several governments.

In order to be admitted as a Dominion Land Surveyor, it is necessary to pass a preliminary examination for admission as a pupil. After three years' service, the pupil is entitled to present himself for final examination for a commission as a Dominion Land Surveyor. At the time of the Colonial Conference (1907), the law authorized a land surveyor licensed in any part of the Empire to present himself for final examination as a Dominion Land Surveyor after one year's service, without having to pass the preliminary examination.

In 1908, the Dominion Lands Surveys Act was passed by Parliament. Advantage was taken of the occasion to introduce an amendment with a view to giving effect to the desire expressed by the Colonial Conference if satisfactory arrangements could be made. The amendment authorized the Board of Examiners if they considered it advisable to do so, to dispense with the final examination of land surveyors from any particular part of the Empire. This amendment was strongly objected to in the Senate on behalf of the Ontario and Quebec land surveyors. Not only was the amendment withdrawn, but the whole section was struck out. Land surveyors from elsewhere than Canada have no longer any special privileges under the present law.

Representations against the new law were made by the Surveyors' Institution of Great Britain, who brought the matter to the attention of the Colonial Office. At their instance, His Majesty's Government invited the Dominion, Commonwealth, State and Provincial Governments to a conference of the Surveyors General of the Colonies, to be held in London on October 24, 1910. The invitation was accepted by the Dominion Government, but declined by all the Provincial Governments in Canada. It was also declined by Newfoundland and by the Union of South Africa. The Commonwealth of Australia, the Australian States and New Zealand asked a postponement of the date of the conference, which was accordingly fixed for the 30th May, 1911.

The delegates at the conference were:—Right Hon. Sir George Reid, P.C., G.C.M.G., K.C., High Commissioner for Australia, representing the Commonwealth; A. A. Spowers, Surveyor General of Queensland, and E. A. Counsel, Surveyor General of Tasmania, representing New Zealand and the Australian States, with the exception of South Australia; E. Deville, LL.D., representing the Dominion of Canada; Col. S. C. N. Grant, C.B., C.M.G., R.E., Director General of the Ordnance Survey, A. Siemens, President, and five other members of the Institution of Civil Engineers; W. Edgar Horne, M.P., President, and five other members of the Surveyors' Institution.



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The proceedings were opened by Lord Lucas, Under Secretary of State for the Colonies. Colonel Sir Duncan Johnston, K.C.M.G., C.B.R.E., late Director General of the Ordnance Survey, was elected chairman, and Mr. A. Goddard, secretary to the Surveyors' Institution, undertook the duties of secretary.

In order that the position of Canada should not be misunderstood, the Surveyor General of Dominion Lands at the first meeting submitted the following statement:—

When the Canadian Confederation was formed, in 1867, there were two Licensing Boards for Land Surveyors: one in Toronto, for the Province of Ontario, and one in Quebec, for the Province of Quebec. The requirements of the two Boards were very much alike, *viz.*, a preliminary examination, three years' service as a pupil under articles, and a final examination. By the British North America Act, property and civil rights had been placed under the control of the Provinces: no one was allowed to make land surveys unless he was a Provincial Land Surveyor.

At that time, the North West Territories were bought by the Dominion Government from the Hudson's Bay Company. These lands being the property of the Dominion and outside of the Provinces, were not under Provincial control, but Provincial Land Surveyors were at first employed for their subdivision because no others were available. In 1872, the need of better control over the surveyors of Dominion lands led to legislation creating Dominion Land Surveyors and a Board of Examiners for their admission. All Provincial Land Surveyors in 1872 were made Dominion Land Surveyors by the new Act. For some years there was reciprocity between the three Boards, but as each one was acting independently, grave abuses arose, and the arrangement was discontinued.

Meanwhile, the Province of Manitoba had been formed out of a part of the Northwest Territories. The Ontario and Quebec Land Surveyors had each the exclusive right to make land surveys within their own Provinces; likewise the Dominion Land Surveyors had similar rights within Manitoba and the Northwest Territories. The other Provinces had no licensed surveyors and the practice of the profession was free.

After 1883, there was a period of dullness in the land business of Manitoba. In order to improve their prospects, the Dominion Land Surveyors of Manitoba formed an association, were incorporated by their legislature as Provincial Land Surveyors, and given the exclusive right to make land surveys within the Province. This was later resented by the Dominion Land Surveyors of the adjoining Territories, who were turned away at the boundaries of Manitoba, while those Manitoba Land Surveyors, who were also Dominion Land Surveyors, could freely practise within the Territories. As soon as the Provinces of Saskatchewan and Alberta were formed, their Dominion Land Surveyors retaliated by obtaining drastic legislation incorporating Land Surveyors Associations in each Province and excluding all other surveyors. This legislation practically abolished Dominion Land Surveyors as a profession, these two Provinces being the last ones where they could practice land surveying. At present, they can only act as employees of the Dominion Government. It follows that although the Surveyor General of Canada is a delegate to the Conference, he does not actually represent any branch of the surveying profession of Canada.

The first proposal of reciprocity was made to Canada at the time of the negotiations between New Zealand and Australia, by Mr. Marchand, then Surveyor General of New Zealand. The Surveyor General of Canada replied that personally he was in favour of the proposal, but it was not until 1908 that an opportunity was found of giving effect to this suggestion. In that year the law respecting Dominion Land Surveyors was recast, and an amendment was introduced authorizing the Board of Examiners to enter into reciprocal arrangements with other parts of the Empire. This amendment was strongly objected to by the Ontario and Quebec surveyors: the opposition in Parliament was such that the Government withdrew not only the proposed amendment but also a previously existing clause granting certain privileges to surveyors from other parts of the Empire. In view of the strong objections of the Canadian



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Surveyors to any proposals of reciprocity, and of the fact that it does not even exist amongst themselves, it seems that there is little prospect of the immediate adoption by them of the wider scheme of reciprocity throughout the Empire.

While recognizing the difficulties which stood in the way, the consensus of opinion among the delegates was that they had been called together for the purpose of preparing a scheme of reciprocity and that it was their duty to prepare such a scheme. The recommendations agreed upon contemplate uniform examinations, the syllabus of which was drafted by the Conference, similar terms of service everywhere and the creation of a Central Board to hear appeals against any of the local examining authorities. The Conference's report concludes as follows:

The free discussion which has taken place at the Conference does not permit the delegates to overlook the difficulties which undoubtedly exist in the way of a general agreement for reciprocity; and although they are conscious that the scheme they have formulated will not provide a complete answer to every objection which can be raised, they venture to submit it as offering a groundwork for a future agreement among the Dominion, Provinces or States who desire to enter into reciprocal arrangements.

Should any Government not find it practicable to accept in its entirety the scheme herein submitted, it may be that they will be able to adopt such parts of it as their circumstances permit. Even if a part only of the examinations for qualifying as surveyors should be accepted throughout the Empire, so that a candidate who had passed that part of the examination in any portion of the Empire would be excused having to undergo it again, in order to qualify as a surveyor in another portion of the Empire, a step forward would be made. In particular, the delegates wish to emphasize the importance they attach to the formation of the Central Board.

## CORRESPONDENCE.

The correspondence of this Branch consisted of:—

Letters received . . . . .	11,675
Letters sent . . . . .	16,120

## ACCOUNTS.

Number of accounts dealt with . . . . .	1,024
Amount of accounts . . . . .	\$943,386
Number of cheques forwarded . . . . .	3,068

## OFFICE STAFF.

The office staff of the Topographical Surveys Branch at Ottawa consists of one hundred and twenty-seven employees, being an increase of one over the staff of last year.

Fifteen appointments were made, one employe was superannuated, nine resigned, while four were transferred to other Branches of the Department.

The appointments were:—Messrs. W. B. Armstrong, J. E. Spero, L. A. Nevins, J. F. McDonald, A. S. Thomas, H. C. Smith, G. N. Clarke, A. G. McLennan, G. H. Watt, G. A. Colquhoun, J. J. Freeland, W. H. Herbert, H. Parry, R. C. Ross and L. G. Smith. Mr. P. B. Symes was superannuated, Messrs. J. E. Umbach, R. C. McCully, C. P. Dubuc, C. M. Ross, A. H. Beaubien, H. Osmond, C. M. Hoar, J. Fredette and B. J. Roe resigned, while Mr. J. A. Belleau was transferred to the Lands Patents Branch, Mr. A. M. Grant to the Chief Astronomer's Branch, Mr. A. Tremblay to the Railway Lands Branch, and Mr. C. E. Marchand to the Geographer's Branch.



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Mr. Symes, Chief Draughtsman, who, on account of continued ill-health, was superannuated after more than forty years of service, was connected with the Branch since its inception in 1873. He was a very valuable officer and had an intimate knowledge of the work, having materially assisted in the growth of the Branch from a small office in the Department of the Secretary of State to its present large dimensions. His unfailing courtesy and patience in his relations with the staff made his retirement a matter of general regret. The position of Chief Draughtsman, rendered vacant by his superannuation, was filled by the promotion of Mr. T. Shanks, B.A. Sc., D.L.S., formerly Assistant Chief Draughtsman. Mr. T. E. Brown, B.A., has been appointed to this latter position and the place formerly held by him, that of chief of the first section, was filled by the promotion of Mr. H. G. Barber.

## CHIEF DRAUGHTSMAN'S OFFICE.

*(T. Shanks, Chief Draughtsman.)*

The progress of our work during the past year was seriously retarded by changes in the personnel and organization of the staff owing to transfers, resignations and absence from various causes.

There is possibly no other Branch in the Service which has suffered more than ours in the last few years from transfers and resignations. During the past year fourteen clerks left the office and the strength of the technical portion of the staff is no greater now than at the time of the reorganization in 1908, although the work has greatly increased. The activity in general engineering work throughout the Dominion has made it difficult to secure or retain properly qualified men and the salaries offered in this Branch of the Service are not sufficiently attractive to offset the advantages of a less restricted career outside where there are brighter prospects for more rapid promotion, greater variety of work and higher remuneration. The reorganization of 1908 and the consequent transfer of many temporary employees to the permanent staff has undoubtedly helped to make the tenure of office more continuous than before, but conditions are not likely to be satisfactory until provision is made for better salaries for technical men and improved facilities for more rapid promotion.

Attention has been repeatedly called to the serious handicap to efficient organization and the prompt despatch of business owing to the fact that our staff cannot be accommodated in one building or in offices convenient to the other Branches of the Department. The nature of our work necessitates frequent reference to the records of old surveys and as these are stored in a separate building the work is subject to awkward interruptions and delays. Moreover, it frequently happens that many of the record books and plans are retained in our offices for long periods, and with no adequate protection from fire. These valuable records comprise a complete history of Dominion land surveys, and as their loss would be irreparable provision should be made as soon as possible for their safe-keeping.

The average number of surveyors employed in the field each year for the past ten years has been sixty-four, about equally divided between contractors and day men. The present tendency is towards an increase in the number of day men, and a corresponding falling off in contract work. One chief cause of this is the fact that as the country becomes settled the amount of work affecting old surveys increases. Errors come to light, monuments disappear, topographical features change, modifications of the old surveys are rendered necessary and the resurveys which result are too complicated to be done under contract. This change brings with it an increase in office work, as instructions to surveyors must be prepared in greater detail than for regular township subdivision, the examination of survey returns is more laborious and the preparation of the more involved plans requires greater skill in draughtsmanship than



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for the ordinary township plans, where much of the draughting and printing are done by mechanical means. The demand for original subdivision is still great, however, and it is estimated that about 180 townships will be surveyed under contract during 1912.

The primary object of our field work is to delimit the land for purposes of disposal and the plans of these surveys which are most urgently needed are those upon which entries may be granted and patents issued. But in addition to the work of marking out the boundaries of sections the surveyor collects much valuable information as to the character of the soil, the topography of the country, the extent of timber and prairie land and the natural resources of the district. An attempt has been made to compile this information in convenient form for reference but little progress has been made owing to the press of urgent routine work. Unless this information is up to date it loses much of its value and it is desirable that some arrangement shall be made to ensure early publication of data which, if one may judge from the inquiries received, are of great interest to the public.

FIRST SECTION—SURVEY INSTRUCTIONS AND GENERAL INFORMATION.

*(H. G. Barber, Chief of Section.)*

In this section instructions are prepared for surveyors engaged in field operations, and the returns of survey sent in by them are entered in the office registers. Preliminary plans are issued for all townships in which subdivision is done, except in the railway belt of British Columbia. This section also has charge of the preparation and issuing of the annual report of the Branch, and the answering of all requests for information from the general public or from other Branches of the Department.

During the year 161 drafts of instructions were issued involving the preparation of 1,905 sketches and 46 maps and tracings. These contained all necessary information regarding Dominion lands, Indian reserves and other surveys already made in the vicinity, as well as all available information as to the nature of the country, roads, trails and methods of transportation.

Preliminary plans were issued for 285 townships. Four copies of each are prepared, one copy being placed on file in this office, and one each being furnished to the Survey Records Branch, the Lands Patents Branch and the Land Agent in whose district the township lies.

The number of files received from the Correspondence Branch for use in the work of the office was 1,800, and the total number of draft letters and memoranda written was 4,930.

The Manual of Instructions for the Survey of Dominion Lands was again revised. It is now almost ready for printing and will be issued in the course of the coming year.

During the year a report on the Peace River district was prepared and issued for the information of intending settlers. It gives a description of the soil, climate and main topographical features and of the various roads and trails leading into the country, with information about the stopping-places, best means of transportation, etc. A map of the district accompanies the report.

Answering communications from settlers and others on various subjects and inquiries from other Branches of the Department forms an important part of the work. The number of communications dealt with during the year was 1,883, requiring the preparation of 3,599 sketches, 34 plans and tracings and 343 pages of field notes.

The office registers show that 1,142 progress sketches were received from the surveyors in the field, as well as 364 books of field notes for township surveys, 188 books and 330 plans for miscellaneous surveys, 235 timber reports, 86 statutory declarations of settlers and returns for 746 magnetic observations and for 29 timber berths. General reports on survey operations were received from thirty-eight surveyors.



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Their examination being completed, 395 books of field notes of township surveys were placed on record together with 89 books and 137 plans of miscellaneous surveys and 86 statutory declarations of settlers.

Plans of 797 townships and 11 settlements or townsites were received from the lithographic office, entered in the registers and distributed, as well as 73 sectional maps and 106 miscellaneous plans.

The staff of this section consists of twenty-one permanent and three temporary employees, but of this number one is engaged the whole time in looking after the vault where numerous valuable records and sectional maps are kept, and the services of another employee are required to attend to requisitions for supplies for the whole Branch and the stationery for the office staff and the staff of surveyors in the field.

SECOND SECTION—EXAMINATION OF RETURNS OF SURVEYS IN MANITOBA, SASKATCHEWAN,  
ALBERTA AND YUKON TERRITORY.

*(T. S. Nash, Chief of Section.)*

The work performed in the second section consists of the examination of the returns of survey of all Dominion lands other than those in the railway belt in British Columbia, and the preparation of the required plans thereof.

As soon as a surveyor completes the survey of a township, or a portion thereof, he forwards a sketch showing the progress of the work in the field. These sketches are examined to see that correct methods are being employed and that accurate results are being obtained. They also form the basis for advances to contractors on progress accounts.

During the year 335 progress sketches from contractors, 440 from men employed by the day and 196 from inspectors of contract surveys were examined, making a total of 971 sketches. Plans of 348 townships were compiled, 209 of which were first edition plans. The total number of township plans compiled is much smaller than in previous years, as the practice of compiling reprints of old surveys where the stock of township plans is exhausted, was discontinued.

An examination was made of 224 subdivision surveys and 186 miscellaneous surveys. Compiled plans of 16 miscellaneous surveys and 24 timber berths were made. Four hundred and nineteen memoranda on the examination of survey returns were sent to surveyors and 355 replies were received and the necessary corrections made. The number of draft letters prepared was 1,350. Twenty-six contract accounts were prepared and closed as the work was shown by the inspector's report to be satisfactorily performed.

In the report of last year it was stated that the question of issuing maps of the surveys in the Yukon Territory would be taken up this year. This has been done; a style of plan has finally been adopted and the first one, which covers the district in the immediate vicinity of Dawson, has been printed, while two others will be printed shortly. The new plan, which covers approximately sixteen miles in latitude and twenty miles in longitude is printed on a scale of one mile to the inch, and shows, in addition to surveys all available geographic information. A new filing cabinet for the Yukon work has been procured and a great number of plans have been thoroughly cross-indexed and filed for ready reference in compiling Yukon surveys. During the year 64 group lot surveys were examined. The remaining part of the Carmack's reference traverse and the returns of survey of the road from Yukon Crossing to Whitehorse were also received and examined.

Requests for information from other Branches of the Department involved the writing of 220 memoranda, the preparation of 126 sketches and the calculation of 1,635 areas.



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Two hundred and ninety-three plans of road diversions and 26 of timber berths were examined. The timber berths comprised 68 blocks and their boundaries totalled 569 miles, while the area is approximately 276 square miles. Twenty-four plans for these berths were prepared.

One hundred and eighty plans of right-of-way of railways were examined, the mileage of which is 3,114. As many of these plans were in duplicate and triplicate the gross mileage of plans examined was 5,892.

A large amount of work has been put upon the preparation of a topographical map of the valley of Fiddle creek, a tributary of Athabaska river in the Jasper Forest Park reserve, and in assisting the surveyor to complete his final returns of this survey.

The staff consists of twenty-six permanent and two temporary employees, but one of the permanent clerks is at present in charge of the office at Dawson, Yukon Territory.

#### THIRD SECTION—PREPARATION OF PLANS FOR REPRODUCTION.

*(C. Engler, Chief of Section.)*

The work of the third section consists in the preparation of copies of plans (which have been compiled in the second, fourth and sixth sections) for reproduction by photo-zincography or photo-lithography.

The appearance and accuracy of the printed copies of the various plans which are issued depend largely on the care given to the production of the fair or finished copies prepared in this section.

The efforts of both draughtsmen and stampers are directed to producing plans on which the information is shown accurately to scale, well arranged and of clean and neat appearance.

The various processes used in preparing fair copy plans have been described in previous reports.

The bulk of the work done in this section has necessarily been in connection with the issuing of township plans. Other plans prepared have been required for showing timber berths, orders in council, settlements or townsites, Yukon Territory group lots, Doukhobor villages and plans for the annual report.

Besides these, there are a number of plans and jobs forming a miscellaneous class in connection with the requirements of the Branch, difficult to classify, but forming an important factor in work of the section.

A statement showing the classification and number of jobs undertaken and completed is given in the report of the Chief Draughtsman.

The staff numbers thirteen, three previous members having been transferred to other Departments or offices, and two appointments having been made.

In addition, the services of an assistant printer are constantly required and three temporary employees were appointed, one of whom has lately been transferred to another Department.

#### FOURTH SECTION—SURVEYS IN THE RAILWAY BELT, BRITISH COLUMBIA.

*(E. L. Rowan-Legg, Chief of Section.)*

Instructions were prepared for surveys to be made in the railway belt and were accompanied by sketches and any other information which it was considered would be of assistance to the surveyors.

The greater part of the subdivision surveys which had to be shown on the township plans compiled during the year were those in which monuments were erected, as far as practicable, at legal subdivision corners and in the centre of legal subdivision



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boundaries along the surveyed lines, so that the lands might be disposed of in parcels of such sizes as may be desired.

On account, therefore, of the additional information required to be shown in connection with these surveys, quarter township plans were made on a scale of twenty chains to one inch. On these are shown the position and nature of all monuments, the distances between them, the bearings of the section or quarter section boundaries, the area of each legal subdivision or quarter section where monuments were placed at quarter section corners only, the section and legal subdivision numbers and provincial lots, Indian reserves, mineral claims, lakes, rivers, creeks and trails.

Field notes of the surveys of mineral claims, of miscellaneous surveys and of timber berths were examined. Plans of timber berths were made, and fair copies of them were forwarded to the Timber Branch.

A plan of the townsite of Field, in section 17, township 28, range 18, west of the fifth meridian, was compiled and printed, and also a second edition of the plan of the town of Lytton in section 6, township 15, range 26 and section 1, township 15, range 27, west of the sixth meridian.

In 1909, Mr. A. W. Johnson made a subdivision survey of villa lots at Woodhaven, in sections 23, 24 and 25, fractional township west of township 39, west of the coast meridian on Bedwell bay, north arm of Burrard inlet, a plan of which was compiled and printed.

This year a plan showing the block outlines of a proposed additional subdivision at Woodhaven was made for the guidance of the surveyor when the survey is being made.

The staff consists of seven permanent clerks, which is two fewer than the staff of the previous year.

## FIFTH SECTION—MAPPING

*(J. Smith, Chief of Section.)*

The principal work of this section is the revision of sectional maps that have already been printed, and the completion of new sheets as they are required. Appendix No. 6 of this report shows the work done in this section during the year on sectional maps.

In addition to these maps, the following drawings were made:—A manuscript chart of the magnetic declination covering the southern part of Canada and the northern part of the United States, drawn on two sheets on a scale of one hundred miles to one inch to be photo-engraved on copper and printed on a scale of three hundred miles to one inch; a map of the Peace River district and one of the Peace River block on a scale of four miles to one inch; a map showing the topography along the fifteenth base line in the vicinity of the second meridian, drawn on a scale of four miles to one inch, to be photo-zincographed on a scale of six miles to one inch; a tracing of part of the Selkirk range on a scale of  $\frac{1}{60,000}$ , to be photo-lithographed on a scale of  $\frac{1}{80,000}$ .

Thirteen permanent employees constitute the staff of this section.

## SIXTH SECTION—SCIENTIFIC AND TOPOGRAPHICAL WORK.

*(G. Blanchard Dodge, Chief of Section.)*

The work performed in general in this section consists of issuing instructions for and plotting returns of levels on meridians and base lines, checking and reducing magnetic observations, calculating astronomical field tables, testing and adjusting survey instruments, and preparing and issuing the pamphlets containing surveyors' township reports, &c.



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The standard of accuracy of the levels on meridians and base lines was raised for 1911, and the difference of elevation between adjacent bench marks was required to be checked by a second independent line, the two lines to check between adjacent bench marks within 0.1 feet multiplied by the square root of the distance in miles.

All the level notes for 1910 have been checked, lists of bench marks prepared and profiles plotted. During the year 1,427 miles of level returns were received while 1,502 miles had been received previously. Level returns were examined and profiles plotted of 1,660 miles. All the lines on which levels have been run prior to March 31, 1912, are shown on a map which accompanies this report.

The number of magnetic declination returns received prior to March 31, 1912, was 2,841, of which 746 were received during the year. A statement of the results with a map showing the isogonic lines in that portion of western Canada covered by the Dominion Lands system of survey is published with this report.

The office computations of triangulation surveys in the railway belt, British Columbia, have been brought up to date, but further information is necessary before much use can be made of the present results. It is hoped that the returns for next season's surveys will supply this information.

All the returns of azimuth observations for the year 1910, received during 1911, have been examined and checked, and also the latitude observations of Mr. J. A. Fletcher, D.L.S., taken during 1911. The astronomical field tables for the year have been computed.

Compiling surveyors' reports on the townships subdivided requires the services of four of the staff. A report on the townships covered by the Fort Pitt sectional sheet has been compiled and sent to the printers for publication.

Information was obtained for a map to accompany the report of 'Descriptions of Surveyed Townships in the Peace River district,' and a rough copy of the map was made with the information added.

A surveys laboratory for testing instruments has lately been built, and it has already proved very useful. Although only a portion of the equipment has been installed, facilities will be provided for testing and adjusting surveying transits, levels, aneroid barometers, measuring tapes, etc., and for rating chronometers and watches.

The number of letters received during the year was 446 while the number of letters sent was 1,130 besides 498 memoranda. Seventy-nine letters of instructions to surveyors were prepared.

The staff of the section consists of fourteen permanent clerks and two temporary clerks.

#### PHOTOGRAPHIC OFFICE.

*(J. Woodruff, Chief Photographer.)*

The offices of the Chief Photographer have been moved to the rooms in the basement formerly occupied by the lithographic office. The rooms have been fitted with the necessary appliances and afford every facility for the work.

There has not been much change in the amount of work executed. Velox and blue printing have increased but other lines have decreased.

The staff of four assistants is the same as last year.



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## PHOTOGRAPHIC OFFICE.

*(H. K. Carruthers, Process Photographer.)*

With the removal of the Chief Photographer's offices to the basement, it has been possible to give increased accomodation to the Process Photographer.

The four dark rooms were made into two rooms, thus providing ample space for handling large zinc plates and glass negatives.

Sectional maps on a scale of three miles to one inch which before required two 18-in. x 20-in. negatives are now made on one 24-in. x 32-in. plate and printed direct on zinc for the press.

Three township plans are printed at one operation on zinc 32-in. x 49-in. and sent direct to the lithographic office ready for the press.

A new automatic mercury vapour lamp was installed. Five tubes are used in connection with a pneumatic printing frame 36-in. x 60-in., an automatic electric pump maintaining the vacuum.

A full set of machines for line and half-tone engraving was set up in the basement of the Imperial building. Twenty-one half-tone engravings were made to illustrate the Peace River report and almost a full set of line cuts for the Manual of Survey.

The staff was increased by the appointment of Mr. Leonard G. Smith as assistant process photographer, and now consists of four men. Mr. Smith has attended for six years the London County Council School of Photography, Engraving and Lithographing, and was six years on the staff of the Geographical Section of the War Office. He has proved a valuable addition to our staff.

In order to answer numerous enquiries concerning our copying camera, a description of the camera has been published in pamphlet form. It is annexed to this report as Appendix No. 51.

## LITHOGRAPHIC OFFICE.

*(A. Moody, Foreman.)*

The lithographic office has been removed to the Imperial building on Queen street where it occupies the whole of the basement. This place was probably the best available in town; it affords splendid accommodation and no better quarters could be had unless a building was erected for that special purpose. The only disadvantage is that the place is a little damp in summer; it causes some trouble in registering coloured impressions.

A power paper-cutter was added to the equipment which now consists of a flat-bed power-press, a rotary offset power-press, three hand-presses for transferring, a zinc-plate graining machine and a power paper-cutter.

The work is for the greater part photo-zincographic printing. A few maps are printed on stone; others are engraved and transferred.

The staff of ten employees is the same as last year.

## GEOGRAPHIC BOARD.

*(A. H. Whitcher, Secretary.)*

The Geographic Board has held a number of meetings and gave decisions on the geographic names submitted. The Chairman is Col. W. P. Anderson, Chief Engineer of Marine and Fisheries, and the report of the Board is published by his Department.

The Secretary is a member of the staff of this office.



## BOARD OF EXAMINERS FOR DOMINION LAND SURVEYORS.

*(F. D. Henderson, Secretary.)*

The Board of Examiners for Dominion Land Surveyors held a special meeting for the examination of candidates from April 29, 1911, to May 18, 1911, during which examinations were held at Ottawa, Toronto, Regina and Vancouver. An adjourned meeting for the preparation of examination papers was held from October 2 to October 12, 1911. The regular annual meeting began on February 12, 1912, and lasted until March 23, 1912. During this meeting examinations were held at Ottawa, Montreal, Kingston, Toronto, Winnipeg, Calgary and Edmonton.

The total number of candidates for examination during the year was 268, as against 257 in 1910-11, and 362 in 1909-10. Of these 186 tried the full preliminary, 9 the limited preliminary, 71 the final, and 2 the examination for Dominion Topographical Surveyor.

Fifty-seven candidates were successful at the preliminary examination as follows:—

## PRELIMINARY EXAMINATION.

Atkins, Cecil Ben., Revelstoke, B.C.	Lowrie, Arthur Wellington Percy, Russell, Ont.
Bedard, Edward L., Courtright, Ont.	Malcolm, William Noel, Winnipeg, Man.
Britton, George Clayton, Whitby, Ont.	Miller, Albert Sherman, Brighton, Ont.
Burland, George Lewis, Ottawa, Ont.	Milliken, John Bolton, Ottawa, Ont.
Burrell, Eric, Yarmouth North, N.S.	Moran, Patrick Joseph, Kingston, Ont.
Byron, Malcolm Ross, Ottawa, Ont.	Murdie, William Campbell, Winthrop, Ont.
Cameron, Charles Scott, Regina, Sask.	MacTavish, William Higgins, Van Camp, Ont.
Campbell, John James, Galt, Ont.	McCaw, Donald Arthur, Welland, Ont.
Carlile, Reginald Clifford, Calgary, Alta.	McDonald, Roderick C., Ripley, Ont.
Carty, Edward Godfrey, Ottawa, Ont.	McFaul, W. Lawrence, Owen Sound, Ont.
Clavell, Edward, Toronto, Ont.	Nesham, Lionel Charles, Ottawa, Ont.
Clarke, Roger Fyfe, Hamilton, Ont.	Nicklin, Harold Raymond, Millbank, Ont.
Clouston, Noel Stewart, Winnipeg, Man.	Noecker, Claude, Waterloo, Ont.
Coursier, Eric Clarence, Revelstoke, B.C.	Oke, William Verner, Toronto, Ont.
de Noblens, Gerard, Aldersyde, Alta.	Platt, Errol Beauchamp, Toronto, Ont.
Duffield, Hugh J., Calgary, Alta.	Rhys, Howard Leonard, Ottawa, Ont.
Ells, Sidney C., Ottawa, Ont.	Robertson, John Donald, Edmonton, Alta.
Falconer, Fairbairn S., Shelburne, Ont.	Ross, Othmar Wallace, Brantford, Ont.
Finnie, Oswald Stirling, Ottawa, Ont.	Somers, Newton Lloyd, Rockford, Ont.
Fournier, Ovide Edouard, Ottawa, Ont.	Spence, William A., Ottawa, Ont.
Fraser, Jonathan William, Ottawa, Ont.	Spero, John Ethelbert, Ottawa, Ont.
Gardner, Charles Turville, Waltham, B.C.	Stidwill, Frank, Cornwall, Ont.
Gardner, James David, Ottawa, Ont.	Tye, Howard Warner, Stratford, Ont.
Grange, Edward Rochfort, Toronto, Ont.	von Gunten, Carl Frederick, Blenheim, Ont.
Hardouin, Joseph, Calgary, Alta.	Walker, George Stuart, Renfrew, Ont.
Heinonen, Henry J., Toronto, Ont.	Watson, Angus Robert, Beaverton, Ont.
Jordan, Edward Elliot, Ottawa, Ont.	Wrong, Frederick Hay, Windsor, Ont.
King, John Albert Shirley, Ottawa, Ont.	Young, Stewart, Owen Sound, Ont.
Le Blanc, Pierre Maxime Henri, Ottawa, Ont.	

Forty-eight candidates were successful at the final examination as follows:—

## FINAL EXAMINATION.

Berry, Edward Wilson, Seaforth, Ont.	Matheson, Hugh, Ottawa, Ont.
Boulton, William James, Wallaceburg, Ont.	Melhuish, Paul, Vancouver, B.C.
Brown, Edgar Carl, Regina, Sask.	Menzies, John Whyte, Ottawa, Ont.
Burd, James Henry, Weyburn, Sask.	MacKay, Ernest George, Hamilton, Ont.
Cline, Carl Gordon, Toronto, Ont.	MacLeod, George Waters, Edmonton, Alta.
Cond, Fritz Thomas Piercy, Vancouver, B.C.	McColl, Samuel Ebenezer, Winnipeg, Man.
Cote, J. Aurele, Ottawa, Ont.	McEwen, Duncan Findlay, Edmonton, Alta.
Dann, Eyre Morton, Kamloops, B.C.	Narraway, Athos Maxwell, Ottawa, Ont.
Dennis, Thomas Clinton, Ottawa, Ont.	Neelands, Rupert A., Hamiota, Man.
Earle, Wallace Sinclair, Victoria, B.C.	Neville, Everett A., Ruthven, Ont.
Fawcett, Sidney Dawson, Ottawa, Ont.	Palmer, Philip Ebenezer, Dorchester, N.B.
Fletcher, James Allan, Fletcher, Ont.	Peckover, Horace Joseph, Toronto, Ont.
Fraser, Donald John, Ottawa, Ont.	Robinson, William Andrew, Winnipeg, Man.



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Galletly, James Simpson, Brooklin, Ont.  
 Greene, Gerald Elliot Denbigh, Toronto, Ont.  
 Haggen, Rupert Williams, Revelstoke, B.C.  
 Hamilton, Charles Thomas, Vancouver, B.C.  
 Higgins, Connell J., Vancouver, B.C.  
 Hobbs, Wilfrid Ernest, Winnipeg, Man.  
 Hunter, A. Ernest, Wiarton, Ont.  
 Inkster, Oluff, Edmonton, Alta.  
 Jackson, John Edwin, Oxford Centre, Ont.  
 Jones, George Samuel, Ottawa, Ont.  
 Lindsay, James Herbert, Regina, Sask.  
 Loucks, Roy William Egbert, Saskatoon, Sask.

Roger, Alexander, Ottawa, Ont.  
 Stewart, Norman Charles, Nelson, B.C.  
 Stitt, Ormond Montgomery, Vancouver, B.C.  
 Stuart, Alexander Graham, Buckingham, Que.  
 Taggart, Charles Henry, Ottawa, Ont.  
 Tate, Harry William, Toronto, Ont.  
 Tipper, George Adrian, Brantford, Ont.  
 Tremblay, Albert Jacques, Edmonton, Alta.  
 Underwood, Joseph Edwin, Saskatoon, Sask.  
 Whyte, Harold Eustace, Victoria, B.C.  
 Wright, Alfred Esten, Prince Rupert, B.C.

As in former years, the time of the Board was largely taken up with the reading and valuation of the candidates' answers and with the preparation of sets of questions for the several examinations. The evidence as to the standing of final candidates, consisting of Provincial certificates in the case of Provincial Surveyors writing under section 21 of the Act, and of affidavits of service under articles in the case of others, had to be examined and passed upon.

The privilege of serving one year under articles instead of three years, as provided by Section 22 of the Act, was extended to graduates of the University of Liverpool holding the Degree of Bachelor of Engineering with Honours, and to graduates of the University of Dublin holding the Degree of B.A.I.

The forms of articles and of the transfer of articles (given in the Schedule of the Act as Forms B and D) are considered by the Board as unnecessarily long and involved. Considerable discussion took place with a view to preparing forms which would be shorter and easier to fill out.

When there are many candidates and when the examinations are held at places distant from Ottawa, it frequently happens that the results of the examinations are not known for a month or more after the candidates have finished writing. Thus the three weeks of grace allowed by the Rules of the Board is not enough to permit candidates who have passed the preliminary examination to come up for final examination one year or three years after as seems the intention of the Act. The Rules of the Board were, therefore, changed in this respect so as to allow any person who passes the preliminary examination and who becomes articulated immediately on receiving notice thereof to write on the final examination in one year or in three years, as the case may be.

Oaths of office and allegiance and bonds for the sum of one thousand dollars each, as required by Section 25 of the Act, were received from, and commissions as Dominion Land Surveyors were issued to, fifty-one surveyors.

Subsidiary standards of length as required by Section 35 of the Act, were tested and issued to thirty-seven surveyors. One standard which had changed hands was retested. A list of surveyors who have been furnished with standard measures up to March 31, 1912, will be found in Appendix No. 10.

The correspondence of the Board was as follows:—

Letters received. . . . .	1,824
Letters sent. . . . .	880
Circular letters, pamphlets, and parcels sent. . . . .	1,517

## APPENDICES.

The following schedules and statements are appended:—

No. 1. Schedule of surveyors employed and work executed by them from April 1, 1911, to March 31, 1912.

No. 2. Schedule showing for each surveyor employed from April 1, 1911, to March 31, 1912, the number of miles surveyed of township section lines, township outlines, traverses of lakes and rivers and resurvey; also the cost of the same.



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No. 3. List of lots in the Yukon Territory, surveys of which have been received from April 1, 1911, to March 31, 1912.

No. 4. List of miscellaneous surveys in the Yukon Territory, returns of which have been received from April 1, 1911, to March 31, 1912.

No. 5. Statement of work executed in the office of the chief draughtsman.

No. 6. List of new editions of sectional maps issued from April 1, 1911, to March 31, 1912.

No. 7. Statement of work executed in the photographic office from April 1, 1911, to March 31, 1912.

No. 8. Statement of work executed in the lithographic office from April 1, 1911, to March 31, 1912.

No. 9. List of employees of the Topographical Surveys Branch at Ottawa, giving the name, classification, duties of office and salary of each.

No. 10. List of Dominion Land Surveyors who have been supplied with standard measures.

No. 11 to 49. Reports of Surveyors employed.

No. 50. The Determination of the Magnetic Declination Dip and Total Force in Western Canada.

No. 51. The Copying Camera.

#### MAPS AND PROFILES.

The following maps and profiles accompany the report of the Topographical Surveys Branch in monograph form:—

Map showing surveys to March 31, 1912.

Map of Mt. Robson and vicinity.

Maps to accompany reports of surveyors.

Profiles of meridians and base lines.

I have the honour to be, Sir,

Your obedient servant,

E. DEVILLE,  
*Surveyor General.*



# TOPOGRAPHICAL SURVEYS BRANCH

## SCHEDULES AND STATEMENTS.

### APPENDIX No. 1.

SCHEDULE of Surveyors employed and work executed by them from April 1, 1911, to March 31, 1912.

Surveyor.	Address.	Description of Work.
Akins, J. R...	Ottawa, Ont...	Survey of the north boundary of the Peace River block, production of the twenty-third base line across ranges 10, 11 and 12, and parts of ranges 9 and 13; survey of the east outlines of townships 85, 86, 87 and 88, range 13, west of the sixth meridian.
Allison, C. B...	South Woodslee, Ont...	Contract No. 4 of 1911. Subdivision of townships 36 and 37, range 20, townships 34, 35 and 36, range 21, the southerly two-thirds of township 33, range 20, and the northerly third of township 33, range 21, west of the principal meridian.
Ashton, A. W...	Ottawa, Ont...	Survey of Blairmore cemetery in township 8, range 4, west of the fifth meridian. Miscellaneous surveys in townships 20 and 21, range 24, and at Lytton in township 15, range 27, west of the sixth meridian.
Aylen, J...	North Bay, Ont...	Contract No. 7 of 1911. Subdivision of township 46 and the north third of township 45, range 9, townships 46, 47, the north third of township 45 and the south two-thirds of township 48, range 10; survey of the north and south outlines of township 47, range 9, west of the second meridian.
Aylsworth, C. F...	Madoc, Ont...	Retracement in townships 13, 14 and 15, range 6, east of the principal meridian; survey of lots in Turtle Mountain and Moose Mountain forest reserves.
Baker, J. C...	Kingston, Ont...	Contract No. 15 of 1911. Subdivision of townships 56, 57, 58, 59 and 60, range 17, and township 57, range 18, west of the third meridian.
Belanger, P. R. A...	Ottawa, Ont...	Inspection of contracts Nos 2 and 3 of 1910. Contracts Nos. 3, 8 and part of contract No. 5 of 1911. Settlement survey at Fisher Bay in township 29, range 2, east of the principal meridian. Subdivision of parts of township 16, range 16, and townships 15 and 16, range 17, east of the principal meridian. Resurvey in township 33, range 8, and townships 31 and 32, range 9, west of the principal meridian.
Bennett, G. A...	Eden, Ont...	Subdivision in townships 13 and 14, range 29, west of the second meridian. Retracement in townships 9 and 10, ranges 10 and 11, townships 7 and 8, range 15, township 8, range 16, township 20, range 17, and townships 10 and 11, range 19, west of the second



APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1911, to March 31, 1912—*Continued.*

Surveyor.	Address.	Description of Work.
		meridian; township 13, range 4, township 25, range 6, townships 13 and 16, range 14, township 19, range 15, and township 26, range 20, west of the third meridian; township 21, range 1, townships 10 and 11, range 5, townships 10, ranges 6 and 10, and township 8, range 21, west of the fourth meridian. Resurvey in township 16, range 13, townships 27 and 28, ranges 14 and 15, township 26, range 23, and township 33, range 26, west of the third meridian; townships 18, ranges 3 and 4, townships 14 and 15, range 10, township 19, range 21, and township 18, range 26, west of the fourth meridian. Investigation in township 15, range 3, and townships 11 and 15, range 4, west of the fourth meridian. Traverse in township 25, range 5, west of the third meridian; townships 14, ranges 21 and 22, and townships 36, ranges 24 and 25, west of the fourth meridian.
Blanchet, G. H. . . .	Ottawa, Ont. . . . .	Survey of the twenty-third base line between the fourth and fifth meridians.
Brenot, L. . . . .	Ottawa, Ont. . . . .	Survey of the western boundary of the Peace River block from the twenty-first base line to the northwest corner of the block.
Bridgland, M. P. . . .	Calgary, Alta. . . . .	Triangulation survey in the railway belt, British Columbia. Survey of villa lots at Banff. Investigation in township 27, range 1, and township 24, range 8, west of the fifth meridian.
Carson, P. A. . . . .	Ottawa, Ont. . . . .	Stadia traverse of North Lillooet river in township 12, east of the coast meridian.
Cautley, R. H. . . . .	Edmonton, Alta. . . . .	Contract No. 23 of 1911. Subdivision of township 49, range 12, townships 49, 50 and 51, range 13, and townships 50 and 51, range 14, west of the fifth meridian.
Chase, A. V. . . . .	Orillia, Ont. . . . .	Examination of lands in the Kamloops district of the railway belt, British Columbia, for the purpose of classification into fruit land, farming land, grazing land, timber land and worthless land. Subdivision in township 14, range 23, township 15, range 26, and townships 14 and 15, range 27, west of the sixth meridian. Traverse in township 15, range 26, and townships 13, 14 and 15, range 27, west of the sixth meridian.
Christie, Wm. . . . .	Prince Albert, Sask. . . . .	Contract No. 11 of 1911. Subdivision of townships 53, 54 and 55, range 8, townships 51, 52 and 53, range 9, and survey of the east outline of township 56, range 9, west of the third meridian.
Cote, J. L. . . . .	Edmonton, Alta. . . . .	Contract No. 21 of 1911. Subdivision of townships 45, 46 and 47, range 7, township 48, range 8, and townships 48 and 49, range 9, west of the fifth meridian. Contour survey of the townsite of Fitzhugh, in township 45, range 1, west of the sixth meridian.
Cumming, A. L. . . . .	Cornwall, Ont. . . . .	Retracement surveys in townships 7, ranges 23 and 24, west of the third meridian; township 44, range 4, township 48, range 10, townships 48 and 49, range 11, townships 50, ranges 13 and 14, and townships 44 and 45,



## SESSIONAL PAPER No. 25b

APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1911, to March 31, 1912—*Continued.*

Surveyor.	Address.	Description of Work.
		range 15, west of the fourth meridian. Subdivision of parts of township 19, range 7, and township 20, range 8; survey of part of the east outline of township 20, range 7, west of the fifth meridian. Traverse in townships 44 and 45, range 15, west of the fourth meridian, and townships 19 and 20, range 7, west of the fifth meridian.
Davies, T. A. . . . .	Edmonton, Alta. . . . .	Contract No. 19 of 1911. Subdivision of townships 67, 68 and the north third of 66, ranges 10, 11 and 12, west of the fourth meridian. Retracement of lots in Lac la Biche settlement in township 67, range 12, west of the fourth meridian.
Day, H. S. . . . .	St. John, N.B. . . . .	Settlement surveys at Pelican, Grand Rapids, McMurray, McKay and Chipewyan, on Athabaska river. Traverse of part of Athabaska river near McKay.
Deans, W. J. . . . .	Brandon, Man. . . . .	Subdivision in township 8, range 26, and townships 2, 3 and 4, range 29, west of the sixth meridian; townships 2 and 38, west of the coast meridian; and townships 14, 17, 18, 19, 20, 22 and 25, east of the coast meridian. Resurvey in townships 2 and 3, range 29, west of the sixth meridian; townships 2 and 38, west of the coast meridian; and townships 17, 18, 19, 20, 22 and 23, east of the coast meridian. Traverse in township 8, range 26, and township 2, range 29, west of the sixth meridian, and townships 20, 22 and 25, east of the coast meridian.
		Survey of timber berth No. 544, in township 2, west of the coast meridian and berth No. 553, in townships 17 and 18, east of the coast meridian.
Fairchild, C. C. . . . .	Brantford, Ont. . . . .	Contract No. 27 of 1911. Subdivision of townships 57, ranges 14, 15, 16 and 17, and township 56, range 18, west of the fifth meridian.
Fletcher, J. A. . . . .	Ottawa, Ont. . . . .	Latitude observations along the principal meridian in townships 35 and 48, and along the fourth meridian in townships 62 and 89.
Fontaine, L. E. . . . .	Levis, Que. . . . .	Inspection of contracts Nos. 15, 29, 30 and 31 of 1910, and contracts Nos. 21, 22, 23, 24, 27 and part of Nos. 20 and 28 of 1911. Re-inspection of contracts Nos. 22 and 23 of 1909. Correction survey in township 47, range 5, and townships 48 and 49, range 6, west of the fifth meridian.
		Survey of part of timber berth No. 1727, in townships 48 and 49, range 6, west of the fifth meridian.
Francis, J. . . . .	Portage la Prairie, M. . . . .	Subdivision of parts of townships 43 and 44, range 20, townships 45 and 46, range 23, and township 46, range 24, west of the fifth meridian.
Gibbon, Jas. . . . .	Vancouver, B.C. . . . .	Contract No. 2 of 1911. Subdivision of townships 28 and 29, ranges 7 and 8, and township 29, range 9, west of the principal meridian.
Green, T. D. . . . .	Ottawa, Ont. . . . .	Contract No. 20 of 1911. Subdivision of townships 41, 42, 43 and 44, range 7, township 41, range 8, and township 39, range 9, west of the fifth meridian.



APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1911, to March 31, 1912—*Continued.*

Surveyor.	Address.	Description of Work.
		Survey of timber berth No. 1788 in townships 40 and 41, range 9, west of the fifth meridian.
Hawkins, A. H.. . . .	Listowel, Ont.. . . .	Survey of the twenty-second base line across ranges 1 to 20, west of the fifth meridian.
Heathcott, R. V.. . . .	Edmonton, Alta.. . . .	Contract No. 26 of 1911. Subdivision of townships 49 and 50, range 20, and township 50, range 21, part of township 49, range 21, and the south third of townships 51, ranges 19, 20 and 21, west of the fifth meridian.
Herriot, G. H.. . . .	Ottawa, Ont.. . . .	Subdivision in township 48, range 26, and townships 48 and 49, range 27, west of the fifth meridian. Correction surveys in townships 51 and 52, range 24, west of the fifth meridian. Contour survey of the land adjoining the Fiddle Creek hot springs in Jasper Forest Park reserve in western Alberta.
Holcroft, H. S.. . . .	Toronto, Ont.... . .	Contract No. 29 of 1911. Subdivision of township 73, range 16, townships 73, 76 and portions of 74 and 75, range 17, townships 74, 75 and 76, range 18 and part of township 76, range 19, and survey of the east outline of township 73, range 19, west of the fifth meridian.
Hubbell, E. W.. . . .	Ottawa, Ont.. . . .	Inspection of contracts Nos. 9, 10, 12, 13, 15 and 16 of 1911; partial inspection of contracts No. 6 of 1910 and No. 11 of 1911. Part subdivision of township 52, range 16, west of the third meridian. Resurvey in townships 45, ranges 27 and 28, west of the second meridian, and townships 45 and 46, range 5, west of the third meridian. Traverse in township 52, range 17, west of the third meridian.
Inkster, O.. . . . .	Edmonton, Alta.. . . .	Contract No. 28 of 1911. Subdivision of townships 56, ranges 19, 20 and 21, townships 55, 56 and the north third of 54, range 22, and the south two-thirds of township 54, range 23, west of the fifth meridian.
Kimpe, M.. . . . .	Edmonton, Alta.. . . .	Contract No. 22 of 1911. Subdivision of townships 48 and 49, range 10, townships 48, 49, 50 and 51, range 11, and townships 48, 50 and 51, range 12, west of the fifth meridian. Survey of timber berth No. 1749 in townships 42 and 43, ranges 13 and 14, west of the fifth meridian.
Laurie, R. C.. . . . .	Battleford, Sask.. . . .	Contract No. 13 of 1911. Subdivision of townships 50, 51 and 52, range 11, and townships 52, ranges 12 and 13, west of the third meridian.
Lighthall, A.. . . . .	Vancouver, B.C.. . . .	Subdivision in township 7, range 29, west of the sixth meridian; township 6, range 4, and townships 4, 5, 6 and 7, range 5, west of the seventh meridian; townships 40 and 41, east of the coast meridian. Resurvey in township 7, range 29, west of the sixth meridian; townships 4 and 6, range 5, west of the seventh meridian; townships 15, 40 and 41, east of the coast meridian. Traverse in township 7, range 29, west of the sixth meridian; township 6, range 4, and townships 4, 5 and 6, range 5, west of the seventh meridian; townships 15, 40 and 41, east of the coast meridian.



## SESSIONAL PAPER No. 25b

APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1911, to March 31, 1912—*Continued.*

Surveyor.	Address.	Description of Work.
		Levelling along the street lines at Woodhaven on Bedwell bay, British Columbia.
		Survey of timber berth No. 547 in township 7, range 29, west of the sixth meridian; timber berths Nos. 546, 548 and 549, in township 6, ranges 4 and 5, west of the seventh meridian.
Lonergan, G. J. . . .	Buckingham, Que. . . .	Inspection of contracts Nos. 27, 28, 32 and 33 of 1910, and contracts Nos. 29, 30, 31 and 32 of 1911. Miscellaneous resurveys in townships 50, 51 and 53, range 27, and townships 50, 51, 53 and 54, range 28, west of the fourth meridian. Correction survey at St. Albert settlement.
McFarlane, J. B. . . .	Toronto, Ont. . . . .	Production of the fourth meridian from the northeast corner of section 13, township 95 to the northeast corner of township 105
		Survey of the twenty-fourth base line across ranges 1, 2, 3 and 4, west of the fourth meridian.
McFarlane, W. G. . . .	Toronto, Ont. . . . .	Contract No. 32 of 1911. Subdivision of townships 77, 78, 79 and 80, ranges 13, 14 and 15, west of the sixth meridian.
McGrandle, H. . . . .	Wetaskiwin, Alta. . . .	Contract No. 25 of 1911. Subdivision of township 51, range 17 and townships 49, 50 and the south third of 51, range 18, west of the fifth meridian.
MacLennan, A. L. . . .	Toronto, Ont. . . . .	Subdivision of townships 56, ranges 25 and 26 and part subdivision of township 57, range 26 and township 56, range 27, west of the principal meridian. Mounding along the fifteenth base line in ranges 25 and 26, west of the principal meridian. Traverse in townships 56, ranges 24, 25 and 26, west of the principal meridian.
		Survey of booming site on Carrot river, in townships 56, ranges 26 and 27, west of the principal meridian.
McMillan, Geo. . . . .	Ottawa, Ont. . . . .	Production of the twenty-first base line across ranges 13 to 26, west of the sixth meridian.
		Survey of the west boundary of the Peace River block from the twenty-first base line to the southwest corner of the block.
McNaughton, A. L. . . .	Cornwall, Ont. . . . .	Part subdivision of townships 46, ranges 18 and 19, townships 47 and 48, range 20, and township 48, range 21, west of the fifth meridian
		Survey of the east outline of township 45, range 20, west of the fifth meridian.
Martindale, E. S. . . .	Kingsmill, Ont. . . . .	Part subdivision of township 17, ranges 4 and 5, townships 17 and 18, range 6, and townships 18 and 19, range 7, west of the fifth meridian. Resurvey in township 23, range 33, west of the principal meridian. Correction survey in township 52, range 4, and townships 36 and 37, range 12, west of the third meridian. Retracement survey in townships 7, ranges 3, 4 and 5, west of the fourth meridian. Traverse of south Saskatchewan river across township 48, range 24A, west of the second meridian.
Matheson, H. . . . .	Ottawa, Ont. . . . .	Correction survey in townships 52 and 53, range 21, townships 51, 52 and 53, range 22 and townships 52 and 53, range 23, west of the fifth meridian.



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APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1911, to March 31, 1912—*Continued.*

Surveyor.	Address.	Description of Work.
Miles, C. F. . . . .	Toronto, Ont. . . . .	Inspection of contracts Nos. 14, 20 and 22 of 1910. Contracts Nos. 17, 18 and 19 of 1911, and part of contract No. 10 of 1910. Re-inspection of contract No. 26 of 1909. Subdivision in townships 61 and 62, range 3, west of the fourth meridian. Retracement in townships 15, 16 and 17, range 27, west of the second meridian and in township 14, range 26, west of the third meridian.
Moberly, H. K. . . . .	Moosomin, Sask. . . . .	Survey of timber berths Nos. 1681 and 1682 in township 44, range 9, townships 44 and 45, range 10, and township 45, range 11, west of the second meridian.
Montgomery, R. H. . . . .	Prince Albert, Sask. . . . .	Contract No. 10 of 1911. Subdivision of townships 53, 54 and 55, range 6, townships 54 and 55, range 7 and survey of the east outlines of townships 56, ranges 6, 7 and part of 8, west of the third meridian. Survey of timber berth No. 1686 in townships 51, ranges 4 and 5, west of the third meridian.
Morrier, J. E. . . . .	Ottawa, Ont. . . . .	Contract No. 9 of 1911. Subdivision of townships 53 and the south two-thirds of 54, ranges 25 and 26, townships 53, ranges 27 and 28, west of the second meridian, and the east half of township 53, range 1, west of the third meridian. Survey of timber berth No. 1785 in townships 44, 45 and 46, range 11, townships 44 and 45, range 12, and township 44, range 13, west of the second meridian.
Nash, T. S. . . . .	Ottawa, Ont. . . . .	Investigation survey in township 2, range 21, west of the principal meridian.
Pequegnat, M. . . . .	Berlin, Ont. . . . .	Contract No. 3 of 1911. Subdivision of township 33, range 8, and townships 32 and 33, ranges 9 and 10, west of the principal meridian.
Plunkett, T. H. . . . .	Meaford, Ont. . . . .	Correction survey and mounding along the fifth meridian through townships 93 to 110, inclusive, and portions of townships 81, 92, 111 and 112; the twenty-eighth base line across ranges 1, 2 and part of 3, and the twenty-ninth base line across part of range 1, west of the fifth meridian.
Ponton, A. W. . . . .	Edmonton, Alta. . . . .	Production of the principal meridian from the thirteenth to the sixteenth base line.
Powell, W. H. . . . .	Ottawa, Ont. . . . .	Contract No. 14 of 1911. Subdivision of townships 61, ranges 12, 14 and 15, and the south two-thirds of townships 62, ranges 12, 13, 14 and 15, west of the third meridian.
Purser, R. C. . . . .	Windsor, Ont. . . . .	Subdivision in township 52, range 20, west of the fourth meridian. Miscellaneous resurveys in township 6, range 9, townships 5 and 25, range 29 and township 8, range 31, west of the principal meridian; township 5, range 7 and township 33, range 21, west of the second meridian; township 36, range 2, township 34, range 3, and township 36, range 6, west of the third meridian; township 43, range 1, township 45, range 2, township 43, range 4, township 44, range 5, township 41, range 9, and township 49, range 20, west of the fourth meridian. Traverse in township 38, range 19, west of the second meridian, and township 43, range 2, west of the third meridian.



SESSIONAL PAPER No. 25b

APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1911, to March 31, 1912—*Continued.*

Surveyor.	Address.	Description of Work.
Ransom, J. T.. . . .	Toronto, Ont.. . . .	Contract No. 5 of 1911. Subdivision of township 39, range 4, township 39 and the south two-thirds of township 40, range 5, and townships 39 and 40, ranges 6 and 7, west of the second meridian.
Rinfret, C.. . . .	Montreal, Que.. . . .	Retracement surveys in township 17, range 16, townships 17, ranges 17 and 19, township 17, range 18, townships 16, ranges 21 and 22, townships 15 and 16, range 23, townships 14, 15 and 16, range 24, townships 17 and 18, range 25, townships 15, 16, 17 and 18, range 26, and township 18, range 27, west of the second meridian. Resurvey in township 25, range 29, township 29, range 31, and townships 32, ranges 32 and 33, west of the principal meridian; township 30, range 14, and township 16, range 25, west of the second meridian, township 23, range 6, township 22, range 9, and townships 14 and 15, range 28, west of the third meridian; township 26, range 16, west of the fourth meridian. Traverse in township 32, range 1, west of the second meridian, and township 28, range 15, west of the fourth meridian.
Robinson, E. W.. . . .	Ottawa, Ont.. . . .	Survey of the second meridian from the northeast corner of township 61, to the northeast corner of section 1, township 68. Production of the fifteenth base line across ranges 1 to 21, west of the second meridian.
Rolfson, O.. . . .	Walkerville, Ont.. . . .	Production of the twenty-second base line across ranges 13 to 26, west of the sixth meridian; survey of the east outlines of townships 83 and 84, and retracement of part of the east outline of township 82, range 13, west of the sixth meridian.
Ross, J. E.. . . .	Kamloops, B.C.. . . .	Subdivision in townships 16, 17 and 18, range 14, and townships 16 and 19, range 15, west of the sixth meridian.
Roy, J. E.. . . .	Quebec, Que.. . . .	Contract No. 12 of 1911. Subdivision of townships 49 and 50, range 9 and townships 50, 51 and 52, range 10, west of the third meridian.
Saint Cyr, A.. . . .	Ottawa, Ont.. . . .	Survey of the seventeenth base line across ranges 13 to 26, and subdivision surveys in townships 65, ranges 26 and 27, west of the third meridian. Reposting along fourth meridian through townships 61, 62 and 63.
Scott, W. A.. . . .	Galt, Ont.. . . .	Subdivision in townships 32 and 33, range 10 and township 32, range 11, west of the third meridian; townships 9, 10, 12 and 13, range 4, and survey of the east outline of township 11, range 5, west of the fifth meridian. Correction survey in township 26, range 15, west of the third meridian. Retracement in townships 7 and 8, range 6, township 8, range 7, townships 45 and 46, range 16, township 45, range 17, and township 60, range 25, west of the fourth meridian. Traverse in township 41, range 13, west of the fourth meridian.
Smith, J. H., .. . .	Edmonton, Alta.. . . .	Contract No. 31 of 1911. Subdivision of township 83 and part of township 82, range 24, townships 82 and 83 and survey of the east



APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1911, to March 31, 1912—*Continued.*

Surveyor.	Address.	Description of Work.
		outlines of townships 84, ranges 25 and 26, west of the fifth meridian; township 79, range 3, townships 75, 76, 78, 79 and the north third of township 74, range 4, and townships 75, 76 and the north third of 74, range 5, west of the sixth meridian.
Steele, I. J. . . . .	Ottawa, Ont. . . . .	Contract No. 31 of 1911. Subdivision of townships 61 and the south two-thirds of township 62, ranges 24, 25, 26 and 27, west of the third meridian.
Stewart, L. D. N. . . . .	Saskatoon, Sask. . . . .	Contract No. 8 of 1911. Subdivision of townships 49, 50, 51, 52 and 53, range 11, west of the second meridian.
Stewart, W. M. . . . .	Saskatoon, Sask. . . . .	Contract No. 16 of 1911. Subdivision of townships 58, 59 and 60, ranges 18 and 19, and survey of the east outline of township 57, range 18, west of the third meridian.
Stock, J. J. . . . .	Ottawa, Ont. . . . .	Contract No. 30 of 1911. Subdivision of townships 77, 78, 79 and 80, range 17, township 80, range 18, and portions of townships 75, 76 and 77, range 16, west of the fifth meridian.
Street, P. B. . . . .	Toronto, Ont. . . . .	Subdivision in township 5, range 4, and townships 5 and 8, range 5, west of the fifth meridian. Retracement in townships 21, ranges 4 and 5, and township 23, range 6, west of the principal meridian; townships 2, ranges 11 and 12, townships 1 and 2, range 13, townships 2, ranges 14 and 15, and townships 7, ranges 29 and 30, west of the fourth meridian. Correction survey in township 9, range 21, west of the second meridian. Traverse in township 23, range 3, east of the principal meridian and township 4, range 1, west of the fifth meridian.
Taggart, C. H. . . . .	Ottawa, Ont. . . . .	Subdivision in townships 23 and 24, range 18, and townships 24 and 25, ranges 19 and 20, west of the fifth meridian; township 23, range 1, townships 22 and 23, range 2, townships 17, ranges 12 and 13, townships 17 and 18, range 14, townships 16, 17 and 18, ranges 15 and 16, township 16, range 17, and townships 17, ranges 18 and 19, west of the sixth meridian. Resurvey in townships 21, 22 and 23, range 1, townships 22 and 23, range 2, and township 16, range 17, west of the sixth meridian. Traverse in township 23, range 18 and township 21, range 29, west of the fifth meridian; townships 21 and 22, range 1, townships 22 and 23, range 2, township 20, range 6, township 22, range 17 and township 17, ranges 18 and 19, west of the sixth meridian.
Teasdale, C. M. . . . .	Concord, Ont. . . . .	Survey of timber berth No. 545 in township 23, range 18, west of the fifth meridian and timber berth No. 550 in township 20, range 6, west of the sixth meridian.
Thompson, W. T. . . . .	Grenfell, Sask. . . . .	Part of contract No. 3 of 1910. Subdivision of township 39, range 10, west of the second meridian.
		Survey of timber berths Nos. 1666, 1667, 1668, 1669, 1670 and 1671 near Sipanok channel in eastern Saskatchewan, and timber berth No. 1790 in township 38, range 28, west of the principal meridian.



## SESSIONAL PAPER No. 25b

APPENDIX No. 1—*Concluded.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1911, to March 31, 1912—*Concluded.*

Surveyor.	Address.	Description of Work.
Waddell, W. H..	Edmonton, Alta..	Contract No. 17 of 1911. Subdivision of townships 58, 59 and 60, range 22, townships 59 and 60, range 23, and township 60, range 24, west of the third meridian. Contract No. 39 of 1911. Subdivision of townships 58, 59 and 60, ranges 20 and 21, west of the third meridian.
Waldron, J..	Moosejaw, Sask..	Contract No. 6 of 1911. Subdivision of township 40 and the north third of township 39, range 8, townships 38 and 40, and the west halves of townships 39 and 41, range 9, the east third of township 41, range 10, the west half of township 41, range 11 and township 41, range 12, west of the second meridian.
Walker, C. M..	Guelph, Ont..	Retracement in townships 13 and 14, range 7, west of the principal meridian. Subdivision in townships 21, 22 and 23, range 6, west of the fifth meridian. Mounding in township 24, range 6, west of the fifth meridian.
Wallace, J. N..	Calgary, Alta..	Levelling northerly from Prince Albert and Lloydminster along the third and the fourth meridians.
Young, W. H....	Lethbridge, Alta..	Contract No. 24 of 1911. Subdivision of township 49, range 14, townships 49, 50 and 51, range 15, and township 51, range 16, west of the fifth meridian.



## APPENDIX No. 2.

SCHEDULE showing for each surveyor employed from April 1, 1911, to March 31, 1912, the number of miles surveyed of township section lines, township outlines, traverses of lakes and rivers and resurvey, also the cost of the same.

Surveyor.	Miles of section lines.	Miles of outlines.	Miles of traverse.	Miles of resurvey.	Total mileage.	Total cost.	Cost per mile.	By day work or by contract.
						\$	\$ cts.	
Akins, J. R. ....	83	49	.....	2	13	27,800	207 46	Day.
Allison, C. B. ....	281	20	131	.....	43	9,997	23 14	Contract.
Aylen, J. ....	216	18	18	5	25	7,582	29 50	"
Aylsworth, C. F. ....	.....	.....	25	54	7	9,554	120 94	Day.
Baker, J. C. ....	277	36	14	.....	327	9,556	29 22	Contract.
Bennett, G. A. ....	4	.....	35	168	20	5,232	25 28	Day.
Blanchet, G. H. ....	.....	150	.....	.....	15	26,340	175 60	"
Brenot, L. ....	39	31	.....	.....	7	17,431	249 01	"
Cautley, R. H. ....	296	36	23	.....	35	10,539	29 69	Contract.
Christie, Wm. ....	280	33	145	.....	458	11,225	24 51	"
Côté, J. L. ....	282	24	.....	.....	306	9,119	29 80	"
Cumming, A. L. ....	44	.....	37	144	22	12,193	54 19	Day.
Davies, T. A. ....	33	42	110	.....	486	12,483	25 69	Contract.
Day, H. S. ....	.....	.....	93	.....	93	7,875	84 68	Day.
Deans, W. J. ....	2	.....	29	23	81	8,525	105 25	"
Fairechild, C. C. ....	234	24	.....	.....	258	8,722	33 81	Contract.
Francis, J. ....	11	5	8	12	140	10,907	77 91	Day.
Gibbon, Jas. ....	20	.....	39	36	27	7,117	25 88	Contract.
Green, T. D. ....	282	30	31	8	351	9,227	26 29	"
Hawkins, A. H. ....	.....	120	.....	.....	120	18,938	157 82	Day.
Heathcott, R. V. ....	231	40	111	.....	382	9,330	24 42	Contract.
Herriot, G. H. ....	27	3	13	18	61	8,181	134 11	Day.
Holcroft, H. S. ....	347	42	22	.....	411	12,197	29 68	Contract.
Inkster, O. ....	264	24	41	.....	32	9,178	27 90	"
Kimpe, M. ....	426	42	60	.....	528	14,881	28 18	"
Laurie, R. C. ....	199	12	54	.....	265	6,692	25 25	"
Lighthall, A. ....	20	.....	9	31	60	8,939	148 98	Day.
MacLennan, A. L. ....	103	11	70	26	210	6,525	31 07	"
Martindale, E. S. ....	5	12	6	134	209	10,753	51 45	"
Matheson, H. ....	.....	.....	43	199	152	3,579	23 55	"
McFarlane, J. B. ....	.....	88	.....	.....	88	22,717	258 15	"
McFarlane, W. G. ....	586	96	70	.....	752	19,395	25 79	Contract.
McGrandle, H. ....	150	28	.....	.....	178	5,566	31 27	"
McMillan, Geo. ....	25	44	.....	4	73	19,653	269 2	Day.
McNaughton, A. L. ....	86	18	7	.....	111	10,564	95 17	"
Montgomery, R. H. ....	261	60	20	6	533	12,310	23 10	Contract.
Morrier, J. E. ....	236	36	8	.....	352	9,304	26 4	"
Pequegnat, M. ....	210	21	1	10	256	7,030	27 46	"
Plunkett, T. H. ....	.....	.....	.....	130	130	17,661	135 85	Day.
Ponton, A. W. ....	.....	72	.....	.....	72	14,233	197 68	"
Powell, W. H. ....	278	50	164	.....	492	12,063	24 52	Contract.
Purser, R. C. ....	10	.....	47	80	137	4,940	36 06	Day.
Ransom, J. T. ....	333	.....	18	6	359	10,685	29 76	Contract.
Rinfret, C. ....	.....	.....	16	787	803	10,840	13 50	Day.
Robinson, E. W. ....	.....	163	.....	.....	163	16,753	102 78	"
Rolfson, O. ....	.....	90	.....	2	92	26,944	292 87	"
Roy, J. E. ....	240	12	214	.....	466	10,045	21 56	Contract.
Saint Cyr, A. ....	9	82	.....	15	106	13,879	130 93	Day.
Scott, W. A. ....	30	24	8	168	230	9,467	41 16	"
Smith, J. H. ....	555	79	58	2	694	18,967	27 33	Contract.
Steele, I. J. ....	300	40	126	.....	466	11,921	25 58	"
Stewart, L. D. N. ....	240	36	27	.....	303	8,866	29 26	"
Stewart, W. M. ....	295	48	37	.....	380	10,934	28 77	"
Stock, J. J. ....	324	54	18	.....	396	11,492	29 02	"
Street, P. B. ....	10	4	5	288	307	8,746	28 49	Day.
Taggart, C. H. ....	57	.....	38	20	115	10,426	90 66	"
Teasdale, C. M. ....	48	.....	12	.....	60	1,580	26 33	Contract.
Waddell, W. H. ....	566	36	225	.....	827	19,554	23 64	"
Waldron, J. ....	290	.....	.....	1	291	8,570	29 45	"
Walker, C. M. ....	75	26	9	22	132	11,348	85 97	Day.
Young, W. H. ....	212	30	10	6	258	8,177	31 69	Contract.
Total. ....	10,098	2,041	2,577	2,317	17,033	715,247		



SESSIONAL PAPER No. 25b

## APPENDIX No. 3.

LIST of lots in the Yukon Territory, survey returns of which have been received from  
April 1, 1911, to March 31, 1912.

## GROUP No. 2.

Lot No.	Acres.	Surveyor.	Year of Survey.	Date of Approval.	Claimant.	Remarks.
228	10.00	F. H. Kitto.	1911	Apr. 12, 1912...	Granville Power Co.	Surface.
295	1.60	"	1911	Mar. 21, 1912...	Chas. Fisher.	Surface.
298	160.00	"	1911	Mar. 21, 1912...	Chas. Fisher.	Surface.
321	51.65	"	1911	Apr. 12, 1912...	Granville Power Co.	"Husky" Min. Cl.
322	51.65	"	1911	Apr. 12, 1912...	Granville Power Co.	"Whiteside" "
323	51.65	"	1911	Apr. 12, 1912...	Granville Power Co.	"Boyle" "
324	51.65	"	1911	Apr. 12, 1912...	Granville Power Co.	"Kitto" "
325	51.65	"	1911	Apr. 12, 1912...	Granville Power Co.	"Alexander" "
326	51.65	"	1911	Apr. 12, 1912...	Granville Power Co.	"Granville" "
333	51.65	"	1911	Apr. 12, 1912...	Granville Power Co.	"Morgan" "
334	51.65	"	1911	Apr. 12, 1912...	Granville Power Co.	"Maggie" "
335	51.65	"	1911	Apr. 12, 1912...	Granville Power Co.	"North Fork" "
336	51.65	"	1911	Apr. 12, 1912...	Granville Power Co.	"Elma" "
337	51.65	"	1911	Apr. 12, 1912...	Granville Power Co.	"White Channel John," Min. Claim
338	51.65	"	1911	Apr. 12, 1912...	Granville Power Co.	"Stella" "
340	22.3	"	1911	Apr. 12, 1912...	John Lee	Surface.

## GROUP No. 5.

115	45.56	H. G. Dickson.	1908	Jan. 2, 1912....	William Clark	"Verona" Mineral Claim.
162	43.39	"	1912	Apr. 12, 1912...	H. G. Dickson.	"Spring Creek" "
173	160.00	"	1910	Sept. 26, 1911...	Karl Weik.	"Keewenaw" "
174	51.65	"	1910	Sept. 26, 1911...	"	"Gladstone" "
175	37.19	"	1910	Jan. 5, 1912....	"	Surface.
201	50.02	"	1910	Sept. 26, 1911...	"	"Northwest" Min- eral Claim.
202	46.50	"	1910	Sept. 26, 1911...	"	"Poppy" "
203	41.64	"	1910	Sept. 26, 1911...	"	"Leary" "
204	50.06	"	1910	Sept. 26, 1911...	"	"Evening Star" "
205	46.53	"	1910	Sept. 26, 1911...	"	"Monteray" "
206	51.65	"	1910	Sept. 26, 1911...	"	"Star Ruby" "
207	44.71	"	1910	Sept. 26, 1911...	"	"Wild Rose" "
208	51.65	"	1910	Sept. 26, 1911...	"	"Big Four" "
209	50.58	"	1910	Sept. 26, 1911...	"	"Alice" "
210	50.90	"	1910	Sept. 26, 1911...	"	"Solo" "
211	43.67	"	1910	Sept. 26, 1911...	"	"Brimstone No. 1 Min. Cl.
212	50.24	"	1910	Sept. 26, 1911...	"	"King Bee" "
213	23.39	"	1910	Sept. 26, 1911...	"	"J. C." "
214	44.62	"	1910	Sept. 26, 1911...	"	"Vivian" "
215	33.76	"	1910	Sept. 26, 1911...	"	"White Pass" "
216	38.02	"	1910	Sept. 26, 1911...	"	"Skagway" "
217	40.45	"	1910	Sept. 26, 1911...	"	"Yukon" "
218	24.94	"	1910	Sept. 26, 1911...	"	"Bismarck" "
219	51.65	"	1910	Sept. 26, 1911...	"	"Contact" "
220	39.78	"	1910	Sept. 26, 1911...	"	"Zelandian" "
221	25.92	"	1910	Sept. 26, 1911...	"	"Rawhide" "
222	64.61	"	1911	Dec. 29, 1911...	J. O. Williams <i>et al.</i>	"May" "
223	23.89	"	1911	Dec. 29, 1911...	"	"Shamrock" "



## GROUP No 6.

Lot No.	Acres.	Surveyor.	Year of Survey.	Date of Approval.	Claimant.	Remarks.
115	51.65	H. G. Dickson..	1910	.....	A. R. Auston <i>et al.</i> .....	"Utah" Min. Claim.
116	51.08	" ..	1910	.....	" ..	" Rambler " "
117	45.38	" ..	1910	.....	" ..	" Montana " "
118	51.65	" ..	1910	.....	" ..	" Colorado " "
119	50.09	" ..	1910	.....	" ..	" Texas " "
120	49.68	" ..	1910	.....	" ..	" Reco " "

## GROUP No. 10.

15	51.65	H. G. Dickson..	1910	May 31, 1911...	John McMeekin <i>et al.</i> .....	"Bonanza" Min. Cl.
16	160.00	" ..	1910	May 31, 1911...	" ..	"County Antrim" Min. Claim.
17	51.65	" ..	1910	Jan. 5, 1912...	Karl Anderson.....	"Sunnyside" "
19	51.20	" ..	1910	May 31, 1911 ..	John McMeekin <i>et al.</i> ..	"Eldorado" "
20	43.81	" ..	1910	May 31, 1911...	" ..	"Hazel May" "
21	30.71	" ..	1910	May 31, 1911...	" ..	"Leroy" Fractional Min. Claim.
22	10.49	" ..	1911	Sept. 25, 1911...	S. Rawlinson.....	Surface.
27	31.82	" ..	1910	Apr. 12, 1912...	Thos. E. Bee <i>et al.</i> ....	"North Star" M. Cl.
28	48.75	" ..	1910	Apr. 12, 1912...	" ..	"South Star" "
29	15.33	" ..	1910	Apr. 12, 1912...	" ..	Surface.
30	15.70	" ..	1910	May 31, 1911...	John McMeekin <i>et al.</i> .....	"Star" Fract. M. Cl.
31	9.93	" ..	1910	Sept. 25, 1911...	Thos. E. Bee ..	Surface.
32	5.10	" ..	1910	Sept. 25, 1911...	C. F. Mack.....	Surface.

## GROUP No. 15.

3	5.65	H. G. Dickson..	1911	Jan. 4, 1912...	Harry Chambers.....	Surface.
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SESSIONAL PAPER No. 25b

## APPENDIX No. 4.

LIST of miscellaneous surveys in the Yukon Territory, returns of which have been received from April 1, 1911, to March 31, 1912.

Year.	Surveyor.	Description of Survey.
1904	C. W. MacPherson.....	Yukon Crossing-Whitehorse division, in fifteen sections of ten miles each, of the Dawson-Whitehorse road.
1911	H. G. Djkson.....	Last division of Carmack's reference traverse for the Department of the Interior.



## APPENDIX No. 5.

## STATEMENT of work executed in the office of the Chief Draughtsman:—

Letters of instruction to surveyors. . . . .	241
Progress sketches received and filed. . . . .	1,142
Declarations of settlers received and filed. . . . .	86
Returns of timber berths received. . . . .	29
Plans received from surveyors. . . . .	330
Field books received from surveyors. . . . .	552
Timber reports received. . . . .	235
Observations for magnetic declination received. . . . .	746
Preliminary township plans prepared. . . . .	328
Sketches made. . . . .	5,995
Maps and tracings made. . . . .	80
Plans of Yukon lots received. . . . .	64
Plans of miscellaneous Yukon surveys received. . . . .	16
Returns of surveys examined—	
Township subdivision. . . . .	276
Township outline. . . . .	252
Road plans. . . . .	293
Railway plans. . . . .	180
Yukon lots. . . . .	64
Miscellaneous Yukon surveys. . . . .	16
Mineral claims. . . . .	51
Timber berths. . . . .	49
Correction and other miscellaneous surveys. . . . .	196
Township plans compiled. . . . .	500
Townsite settlement and other plans compiled. . . . .	19
Proofs of plans examined. . . . .	34
Township plans printed. . . . .	797
Townsite and settlement plans printed. . . . .	11
Miscellaneous plans printed. . . . .	106
Descriptions written. . . . .	11
Areas calculated. . . . .	1,635
Pages of field notes copied. . . . .	343
Applications for various information dealt with. . . . .	2,973
Files received and returned. . . . .	1,848
Letters and memoranda drafted. . . . .	8,711
Books received from Record Office and used in connection with office work. . . . .	5,266
Books returned to Record Office. . . . .	5,417
Plans other than printed township plans received from Record Office and used in connection with office work. . . . .	951
Plans returned to Record Office. . . . .	890
Volumes of plans received from Record Office and used in connection with office work. . . . .	140
Volumes of plans returned to Record Office. . . . .	129
Books sent to Record Office to be placed on record. . . . .	484
Plans other than township plans sent to Record Office to be placed on record. . . . .	137
Sectional maps (3 miles to 1 inch)—	
Revised. . . . .	43
Reprinted. . . . .	34
Sectional maps (6 miles to 1 inch)—	
Reprinted. . . . .	23



## SESSIONAL PAPER No. 25b

## APPENDIX No. 6.

LIST of new editions of Sectional Maps compiled from April 1, 1911, to March 31, 1912.

Scale 3 miles to one inch.

No.	Name.	No.	Name.	No.	Name.	No.	Name.
18	Wood Mountain....	119	Regina.....	172	Fairford.....	271	Mossy Portage.....
23	Emerson.....	120	Qu'Appelle.....	173	Washow.....	313	Brule.....
64	Porcupine.....	121	Riding Mountain....	213	Athabaska.....	318	Shell River.....
65	Macleod.....	122	Manitoba House....	214	Rocky Mt. House...	319	Prince Albert North.
68	Swift Current.....	123	Fort Alexander....	216	Sullivan Lake.....	320	Carrot River.....
70	Moose Mountain....	163	Donald.....	221	Swan River.....	366	Saddle Lake.....
71	Brandon.....	165	Rosebud.....	266	Ribstone Creek....	462	Dunvegan.....
72	Portage la Prairie..	169	Touchwood.....	269	Prince Albert South.		
73	Winnipeg.....	170	Yorkton.....	270	Pasquia.....		

Scale 6 miles to one inch.

No.	Name.	No.	Name.	No.	Name.	No.	Name.
20	Souris.....	71	Brandon.....	169	Touchwood.....	219	Humboldt.....
21	Turtle Mountain....	72	Portage la Prairie..	172	Fairford.....	221	Swan River.....
64	Porcupine.....	73	Winnipeg.....	173	Washow.....	267	Battleford.....
68	Swift Current.....	118	Rush Lake.....	214	Rocky Mt. House...	268	Carlton.....
69	Moosejaw.....	120	Qu'Appelle.....	216	Sullivan Lake.....	366	Saddle Lake.....
70	Moose Mountain....	163	Donald.....	218	Saskatoon.....		



## APPENDIX No. 7.

STATEMENT of work executed in the Photographic Office from April 1, 1911 to March 31, 1912.

	3½ x 3½	3½ x 5½	5 x 7	8 x 10	10 x 12	11 x 14	15 x 18	16 x 18	18 x 20	20 x 24	24 x 30	24 x 32	30 x 36	32 x 49	36 x 42	42 x 48	Total.
Dry plates and films.....																	
Bromide prints.....		580	832	17	5	23											1,435
Solho prints.....		18	4	202		344		80	96	13	24		24		38	69	732
Velox prints.....	366	6,522	3,664	13	57	29											1,312
Artura prints.....		332	1,027	4													10,622
Vandyke prints.....				10	13	18		56	82	48	62		114		99	9	1,363
Blue prints.....			8	25	74	47		85	90	79	140		104		61	98	519
Lantern transparencies.....																	853
Photographs mounted.....	195																195
Wet plate negatives.....		443	614	21	1	15		22	16		4						1,136
Photo-litho plates.....				67		174	105	978	116	21			2	27			1,463
								1,114									1,141
Totals.....	561	7,937	7,238	359	150	650	105	1,221	1,514	161	230	2	242	27	198	176	20,771



SESSIONAL PAPER No. 25b

## APPENDIX No. 8.

STATEMENT of work executed in the Lithographic Office from April 1, 1911, to March 31, 1912.

Month.	MAPS.			TOWNSHIP PLANS.			FORMS.		
	No.	Copies.	Im-pressions.	No.	Copies.	Im-pressions.	No.	Copies.	Im-pressions.
1911.									
April.....	8	4,000	4,000	122	24,400	24,400	1	600	1,200
May.....	11	7,150	15,375	38	7,600	8,200	2	10,600	10,600
June.....	1	150	150	1	200	200	4	375	375
July.....	15	4,400	5,225	87	17,400	18,400	2	550	650
August.....	15	11,025	26,825	58	11,600	12,800	9	4,000	4,900
September.....	13	5,950	7,125	155	31,000	31,900	7	6,260	6,260
October.....	16	7,250	7,250	37	7,206	7,206	3	720	920
November.....	8	3,820	3,820	158	31,600	31,600	3	2,220	2,220
December.....	10	4,500	4,500	98	19,600	19,600			
1912.									
January.....	11	16,280	71,075	55	11,000	12,000	9	19,925	22,925
February.....	9	4,125	5,250				4	2,500	2,500
March.....	17	87,825	156,140	32	6,400	6,400	6	15,200	15,200
Total.....	134	156,475	306,735	841	168,006	171,806	50	62,950	67,750

## RECAPITULATION.

	No.	Copies.	Impressions.	Cost.
Maps.....	134	156,475	306,735	2,734 00
Townships.....	841	168,006	171,806	4,060 00
Forms.....	50	62,950	67,750	850 00
Grand total.....	1,025	387,431	546,291	7,644 00



## APPENDIX No. 9.

LIST of employes of the Topographical Surveys Branch at Ottawa, giving the name, classification, duties of office and salary of each. (Metcalf street, corner of Slater.)

Name.	Classification.		Duties of Office.	Salary.
	Division.	Sub-division.		
				\$
Deville, E., D.T.S., LL.D.....	1	A	Surveyor General.....	3,650
	Correspondence.			
Brady, M.....	1	B	Secretary.....	2,400
Cullen, M.J.....	3	A	Stenographer.....	1,200
Moran, J. F.....	3	A	Typewriter and clerk.....	900
Williams, E. R.....	3	A	Correspondence clerk.....	900
Addison, W. G.....	3	B	Typewriter.....	800
Pegg, A.....			Messenger.....	800
O'Meara, M. T.....			".....	550
Pick, A. C.....			".....	500
	Accounts.			
Hunter, R. H.....	2	A	Accountant.....	2,100
Wilkinson, Percy.....	3	A	Asst. Accountant.....	1,100

Chief Draughtsman's Office—General direction and supervision of the technical work.

Shanks, T., B.A.Sc., D.L.S.....	1	B	Chief draughtsman.....	2,550
Brown, T. E., B.A.....	1	B	Asst. chief draughtsman.....	2,550



## SESSIONAL PAPER No. 25b

## Chief Draughtsman's Office, First Section—Survey instructions and general information.

Name.	Classification.		Duties of Office.	Salary.
	Division	Sub-division.		
				\$
Barber, H. G., Grad. S.P.S.	2	A	Chief of section	1,900
Rice, F. W., Grad. School of Mining	2	A	Asst. chief of section	1,900
MacIlquham, W. L., B.Sc.	2	A	" "	1,900
Peaker, W. J., Grad. S.P.S.	2	A	" "	1,600
Sylvain, J.	2	A	" "	1,650
Carroll, M. J., Grad. S.P.S.	2	B	Draughtsman	1,600
Rochon, E. C.	2	B		1,400
McRae, A. D., B.A., B.Sc.	2	B		1,400
Grant, A. W., B.A.	2	B		1,400
Hayward, H. E., B.Sc.	2	B		1,300
Milliken, J. B., B.A., B.Sc.	2	B		1,300
MacMillan, J. P., B.E.	2	B		1,300
Wadlin, L. N., B.Sc.	2	B		1,200
Cordukes, J. P., B.Sc.	2	B		1,200
Gagnon, J. N. H., B.A.S.	2	B		1,050
Armstrong, W. B., B.Sc.	2	B	Clerk	1,200
Spero, J. E.	2	B		1,200
Nevins, L. A., B.A.	2	B		1,200
McDonald, J. F., B.A.	2	B		1,200
Holbrook, C. H.	3	A		950
Burkholder, E. L.	3	A		900

## Chief Draughtsman's Office, Second Section—Surveys in Manitoba, Saskatchewan, Alberta and Yukon Territory.

Nash, T. S., Grad. S.P.S., D.L.S.	1	B	Chief of section	2,550
Burgess, E. L., Grad. S.P.S., D.L.S., O.L.S.	2	A	Asst. chief of section	1,900
Dennis, E. M., B.Sc.	2	A	" "	1,900
Elder, A. J., Grad. S.P.S., D.L.S.	2	A	" "	1,900
Henderson, F. D., Grad. S.P.S., D.L.S.	2	A	" "	1,900
Hill, S. N., Grad. S.P.S.	2	A	" "	1,900
Genest, P. F. X., Q.L.S.	2	A	" "	1,900
Robertson, D. F., Grad. S.P.S.	2	A	" "	1,700
Kitto, F. H., D.L.S.	2	A	In charge of Dawson office Draughtsman	1,600
Sutherland, H. E., B.Sc.	2	B		1,400
McClelland, W. D.	2	B	"	1,600
Roger, A., O.L.S.	2	B	"	1,600
Spreckley, R. O.	2	B	"	1,500
Goodday, Leonard	2	B	"	1,400
Bray, K. P.	2	B	"	1,400
Harrison, E. W.	2	B	"	1,300
Ault, H. W.	2	B	"	1,300
Lytle, W. J.	2	B	"	1,050
LaBeree, E. E.	2	B	"	1,050
Jones, G. S., Grad. S.P.S., O.L.S.	2	B	"	1,050
Bradley, J. D.	2	B	"	1,050
Cagnat, G. H.	2	B	Z	1,050
Fournier, O. E., B.A.S.	2	B	"	1,050
Thomas, A. S., B.Sc.	2	B	"	1,200
Smith, H. C.	2	B	"	1,200
Macdonald, J. A.	3	B	Clerk	800



3 GEORGE V., A. 1913

Chief Draughtsman's Office, Third Section—(Imperial Building, Queen street).  
Copying plans for reproduction.

Name.	Classification.		Duties of Office.	Salary.
	Division	Sub-division.		
Engler, Carl, B. A., D.L.S.....	1	B	Chief of section.....	\$ 2,100
May, J. E.....	2	A	Asst. chief of section....	1,900
O'Connell, J. R.....	2	A	Draughtsman.....	1,700
Moule, W. J.....	2	B	".....	1,600
Helmer, J. D.....	2	B	".....	1,100
Dawson, R. J.....	2	B	".....	1,100
Archambault, E.....	2	B	".....	1,100
Clarke, G. N.....	2	B	".....	800
Watters, James.....	3	A	Printer.....	1,200
McLennan, A. G.....	3	A	Clerk.....	1,200
Brown, A.....	3	A	".....	900
Ebbs, E. J.....	3	A	".....	900
Baril, C.....	3	B	Draughtsman.....	750

Chief Draughtsman's Office, Fourth Section—(Metcalf street, corner of Slater).  
British Columbia surveys.

Rowan-Legg, E. L.....	2	A	Chief of section.....	2,050
Gillmore, E. T. B., Grad. R.M.C.....	2	A	Asst. chief of section....	2,000
Lawe, H., D.L.S.....	2	A	" ".....	1,900
Morley, R. W.....	2	A	" ".....	1,900
Weld, W. E.....	2	A	" ".....	1,900
Wilson, E. E. D., B. Sc.....	2	A	" ".....	1,600
Harris, K. D.....	2	B	Draughtsman.....	1,300

Chief Draughtsman's Office, Fifth Section—(Imperial Building, Queen street).  
Mapping.

Smith, J.....	1	B	Chief of section.....	2,550
Begin, P. A.....	2	A	Asst. chief of section....	1,950
Flindt, A. H.....	2	A	" ".....	1,700
Blanchet, A. E.....	2	B	Draughtsman.....	1,600
Davies, T. E. S.....	2	B	".....	1,600
Perrin, V.....	2	B	".....	1,600
D'Orsonnens, A.....	2	B	".....	1,600
Davy, E.....	2	B	".....	1,400
Villeneuve, E.....	2	B	".....	1,100
Bergin, W.....	2	B	".....	1,100
Howie, Jas.....	2	B	".....	1,000
Purdy, W. A.....	2	B	".....	1,100
Brigly, J. H.....	2	B	".....	1,300



## SESSIONAL PAPER No. 25b

Chief Draughtsman's Office, Sixth Section—(Imperial Building, Queen street).  
Scientific and topographical work.

Name.	Classification.		Duties of Office.	Salary.
	Division	Sub-division		
				\$
Dodge, G. B., D.L.S. ....	1	B	Chief of section. ....	2,550
Côté, J. A., Grad. R.M.C. ....	2	A	Asst. chief of section. ....	1,600
Watt, G. H., Grad. S.P.S., D.L.S. ....	2	A	" " ....	1,900
Blanchard, J. F. ....	2	B	Draughtsman. ....	1,050
Chartrand, D. E., B.Sc. ....	2	B	" " ....	1,100
Colquhoun, G. A., B.Sc. ....	2	B	" " ....	1,200
Cousineau, A., B.Sc. ....	2	B	" " ....	1,100
Dozois, L. O. R., Grad. R.M.C. ....	2	B	" " ....	1,100
Freeland, J. J., M.A. ....	2	B	" " ....	1,200
Herbert, W. H., B.Sc. ....	2	B	" " ....	1,200
Parry, H., B.Sc., D.L.S. ....	2	B	" " ....	1,000
Ross, R.C., B.Sc. ....	2	B	" " ....	1,200
Lynch, F. J. ....	3	B	Typewriter. ....	800
Watson, J. W. ....	3	B	Clerk. ....	750

## Geographic Board (Woods Building, Slater street).

Whitcher, A. H., F.R.G.S., D.L.S. ....	2	A	Secretary . . . . .	2,100 00
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## Photographic Office (Metcalf street, corner Slater street).

Carruthers, H. K. ....	2	A	Process photographer. ....	1,900
Woodruff, John. ....	2	A	Chief " " ....	1,900
Smith, L. G. ....	2	B	Photographer. ....	800
Whitcomb, H. E. ....	3	A	" " ....	1,200
Morgan, W. E. ....	3	A	" " ....	1,200
Kilmartin, A. ....	3	A	Asst. photographer. ....	900
Devlin, A. ....	3	B	" " ....	800
Quimet, E. G. ....	3	B	" " ....	800

## Lithographic Office (unclassified) (Metcalf street, corner Slater street).

Name.	Occupation.	Salary.
Moody, A. ....	Foreman. ....	\$27 00 per week.
Burnett, E. ....	Lithographer. ....	25 00 "
Thicke, C. R. ....	" " ....	23 00 "
Deslauriers, J. H. ....	Transferrer. ....	20 00 "
Bergin, J. ....	Printer. ....	21 00 "
Thicke, H. S. ....	" " ....	20 00 "
Boyle, S. ....	Stone polisher. ....	15 00 "
Gagnon, J. ....	Press feeder. ....	12 00 "
Kane, P. ....	" " ....	9 50 "
Easton, R. M. ....	Printer. ....	19 50 "
Hare, E. H. ....	Asst. photographer. ....	15 00 "



## APPENDIX No. 10.

LIST of Dominion Land Surveyors who have been supplied with Standard Measures.

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Akins, James Robert.....	Ottawa, Ont.....	Sept. 2, '76	Mar. 14, '10	
Allison, Calvin Bruce.....	South Woodslee, Ont.	June 16, '84	Mar. 28, '10	
Ashton, Arthur Ward.....	Ottawa, Ont.....	Nov. 5, '80	May 29, '08	
Austin, George Frederick.....	Not known.....		April 14, '72	
Aylen, John.....	North Bay, Ont.....		May 29, '85	
Aylsworth, Charles Fraser.....	Madoc, Ont.....	April 21, '62	May 13, '86	O. L. S.
Baker, James Clarence.....	Vermilion, Alta.....	May 12, '78	May 18, '06	
Baker, Mason Hermon.....	St. Thomas, Ont.....	July 9, '84	Aug. 6, '08	O. L. S.
Bartlett, Ernest.....	Smithville, Ont.....		Jan. 16, '11	
Bayne, George A.....	Winnipeg, Man.....	Oct. 25, '50	April 14, '72	M. L. S.
Beatty, David.....	Parry Sound, Ont.....	Dec. 22, '42	April 14, '72	O. L. S.
Begg, William Arthur.....	Hamilton, Ont.....	July 15, '82	June 8, '09	
Belanger, Phidime Roch Arthur	Ottawa, Ont.....	Mar. 5, '53	May 17, '80	Inspector of Surveys, Topographical Surveys Branch, Dept. of the Interior.
Belleau, Joseph Alphonse.....	Ottawa, Ont.....	Sept. 30, '56	May 15, '83	Topographical Surveys Branch, Dept. of the Interior.
Belyea, Albert Palmer Corey.....	Edmonton, Alta.....		July 14, '09	
Bemister, George Bartlett.....	Winnipeg, Man.....		June 11, '78	M. L. S. Engineering Dept. C. N. R.
Bennett, George Arthur.....	Eden, Ont.....	May 18, '86	Aug. 25, '10	
Berry, Edward Wilson.....	Seaforth, Ont.....	Aug. 26, '81	May 18, '11	
Bigger, Charles Albert.....	Ottawa, Ont.....	Aug. 15, '53	Mar. 30, '82	B. C. L. S., O. L. S., Assist- ant Superintendent Geodetic Survey.
Bingham, Edwin Ralph.....	Fort William, Ont..		'78 Oct. 25, '06	O. L. S.
Blanchet, Guy Houghton.....	Ottawa, Ont.....	Feb. 12, '84	Mar. 10, '10	
Boswell, Elias John.....	Not known.....		Mar. 18, '03	O. L. S., M. L. S.
Bourgeault, Armand.....	St. Jean Port Joli, Que.....	Feb. 23, '58	Mar. 29, '83	Q. L. S.
Bourgault, Charles Eugene.....	Launzon, Levis, Que.	Sept. 6, '61	Feb. 21, '88	
Bourget, Charles Arthur.....	Launzon, Que.....	Aug. 26, '51	May 14, '84	Q. L. S.
Bowman, Edgar Peterson.....	West Montrose, Ont.		Sept. 26, '07	O. L. S.
Bowman, Herbert Joseph.....	Berlin, Ont.....	June 18, '65	Feb. 16, '88	O. L. S.
Brabazon, Alfred James.....	Ottawa, Ont.....		May 13, '82	Boundary Survey, Dept. of the Interior.
Brady, James.....	Golden, B. C.....	Nov. 24, '40	April 14, '72	O. L. S., B. C. L. S.
Bray, Samuel.....	Ottawa, Ont.....	Nov. 5, '46	Nov. 14, '83	O. L. S., Chief Surveyor, Dept. of Indian Affairs.
Bray, Lennox Thomas.....	Amherstburg, Ont..	Mar. 14, '77	Feb. 18, '03	O. L. S.
Brenot, Lucien.....	Ottawa, Ont.....	Aug. 31, '87	Mar. 18, '10	
Bridgland, Morrison Parsons.....	Calgary, Alta.....	Dec. 20, '78	Mar. 10, '05	
Broughton, George Henry.....	Penticton, B. C.....	Aug. 12, '86	June 3, '09	B. C. L. S.
Brown, Charles Dudley.....	Winnipeg, Man.....	Feb. 25, '83	April 4, '10	
Brown, Edgar Carl.....	Regina, Sask.....	Nov. 28, '86	May 23, '11	
Brown, Thomas Wood.....	Edmonton, Alta.....		June 21, '09	
Brownlee, James Harrison.....	Vancouver, B. C.....	Mar. 22, '56	April 15, '87	M. L. S., B. C. L. S.
Bucknill, Walter Birch.....	Vancouver, B. C.....	May 8, '73	Mar. 19, '08	B. C. L. S.
Burd, James Henry.....	Weyburn, Sask.....	Sept. 7, '71	May 18, '11	O. L. S., S. L. S.
Burgess, Edward LeRoy.....	Ottawa, Ont.....	May 5, '78	Feb. 23, '05	O. L. S., T. S. Branch, Dept. of Interior.
Burnet, Hugh.....	Victoria, B. C.....		June 22, '85	O. L. S., B. C. L. S.
Burwash, Nathaniel Alfred.....	Whitehorse, Y. T.....	Sept. 28, '79	Mar. 6, '07	O. L. S.
Burwell, Herbert Mahlon.....	Vancouver, B. C.....	Oct. 23, '63	Feb. 17, '87	B. C. L. S.
Campbell, Alan John.....	Sidney, B. C.....	Oct. 1, '82	April 13, '09	
Campbell, Alexander Stewart.....	Kingston, Ont.....	Mar. 7, '80	Mar. 6, '09	
Carbert, Joseph Alfred.....	Medicine Hat, Alta.	Feb. 4, '56	May 12, '80	O. L. S., District Engineer and Surveyor, Dept. of Public Works, Alberta.
Carpenter, Henry Stanley.....	Regina, Sask.....	Feb. 8, '74	Feb. 20, '01	Dept. of Public Works, O. L. S.
Carroll, Cyrus.....	Regina, Sask.....	Dec. 6, '34	April 14, '72	O. L. S.



## SESSIONAL PAPER No. 25b

## APPENDIX No. 10.—Continued.

## LIST of Dominion Land Surveyors who have been supplied with Standard Measures—Continued.

Name.	Address.	Date of Birth.	Date of Appointment or of Commission	Remarks.
Carson, Percy Alexander.....	Kamloops, B.C.....	Dec. 25, '77	Feb. 22, '06	Hydrographic Survey.
Carthew, William Morden....	Edmonton, Alta.....	Oct. 19, '86	Mar. 29, '10	
Cautley, Reginald Hutton.....	Edmonton, Alta.....	Dec. 6, '79	May 1, '05	
Cautley, Richard William.....	Edmonton, Alta.....	Aug. 3, '73	Sept. 2, '96	
Cavana, Allan George.....	Orillia, Ont.....	Jan. 22, '58	Nov. 16, '76	O.L.S.
Charlesworth, Lionel Clare....	Edmonton, Alta.....	Nov. 17, '73	Mar. 24, '03	O.L.S., Dept. of Public Works for Alberta.
Chase, Albert Victor.....	Orillia, Ont.....	Mar. 4, '83	Oct. 11, '10	O.L.S.
Chilver, Charles Alonzo.....	Walkerville, Ont.....	Feb. 8, '83	Feb. 22, '07	
Christie, William.....	Prince Albert, Sask.	Feb. 13, '76	Mar. 22, '06	
Clarke, Charles Wentworth....	Regina, Sask.....	Nov. 19, '75	Mar. 24, '10	
Cleveland, Ernest Albert.....	Vancouver, B.C.....	May 12, '74	June 27, '99	B.C.L.S.
Coates, Preston Charles.....	Victoria, B.C.....	May 16, '81	Apr. 19, '07	B.C.L.S.
Cokely, Leroy S.....	Merritt, B.C.....	Nov. 23, '84	Mar. 22, '10	
Côté, Joseph Adélard.....	Prince Albert, Sask.	June 5, '64	May 14, '84	
Côté, Jean Léon.....	Edmonton, Alta.....	May 6, '67	Mar. 21, '90	
Cotton, Arthur Frederick.....	Nassett, B.C.....	Aug. 8, '52	May 11, '80	O.L.S., B.C.L.S.
Craig, John Davidson.....	Ottawa, Ont.....	Jan. 30, '76	Feb. 24, '02	Boundary Surveys, Dept. of the Interior.
Cumming, Austin Lewis.....	Cornwall, Ont.....	Aug. 25, '82	Feb. 3, '10	
Cummings, Alfred.....	Fernie, B.C.....	July 3, '80	Mar. 3, '09	B.C.L.S.
Cummings, John George.....	Cranbrook, B.C.....	Nov. 19, '73	Feb. 17, '04	B.C.L.S.
Dalton, John Joseph.....	Weston, Ont.....	June 12, '54	Apr. 17, '79	O.L.S., D.T.S.
Davies, Thomas Attwood.....	Edmonton, Alta.....		Feb. 22, '06	
Dawson, Frederick James.....	Ashcroft, B.C.....	Sept. 22, '86	Sept. 12, '10	
Day, Harry Samuel.....	St. John, N.B.....	Nov. 14, '85	Mar. 9, '10	
Deans, Williams James.....	Brandon, Man.....	May 4, '60	May 13, '86	O.L.S.
de la Condamine, C.....	High River, Alta.....	Feb. 13, '75	May 4, '10	
Dennis, John Stoughton.....	Calgary, Alta.....	Oct. 22, '66	Nov. 19, '77	D.T.S.
Denny, Herbert C.....	Not known.....		Apr. 1, '82	
Dickson, Henry Godkin.....	Whitehorse, Y.T.....	Mar. 29, '64	Mar. 19, '89	M.L.S.
Dickson, James.....	Fenelon Falls, Ont.....	Oct. 30, '34	Apr. 14, '72	O.L.S.
Dobie, James Samuel.....	Thessalon, Ont.....	Oct. 15, '73	Mar. 22, '06	O.L.S.
Doupe, Jacob Lonsdale.....	Winnipeg, Man.....	Sept. 14, '67	Oct. 6, '88	M.L.S., Asst. Land Commissioner for C.P.R.
Drewry, William Stewart.....	Nelson, B.C.....	Jan. 20, '59	Nov. 14, '83	O.L.S., B.C.L.S.
Driscoll, Alfred.....	Edmonton, Alta.....	July 2, '65	Feb. 23, '87	B.C.L.S.
Drummond, Thomas.....	Montreal, P.Q.....	1856	June 24, '78	D.T.S.
Ducker, William A.....	Winnipeg, Man.....	Apr. 4, '52	Mar. 30, '83	O.L.S., M.L.S.
Dumais, Paul T. Concorde....	Hull, P.Q.....	Jan. 2, '47	Mar. 29, '82	Q.L.S.
Earle, Wallace Sinclair.....	Victoria, B.C.....	Feb. 8, '89	May 18, '11	
Edwards, George.....	Ponoka, Alta.....	June 13, '42	Apr. 14, '72	O.L.S.
Edwards, William Milton.....	Lethbridge, Alta.....	June 21, '79	Apr. 5, '10	
Ellacott, Charles Herbert....	Victoria, B.C.....	Dec. 24, '66	Feb. 22, '99	B.C.L.S.
Empey, John Morgan.....	Calgary, Alta.....	Apr. 16, '74	Feb. 23, '05	O.L.S.
Engler, Carl.....	Ottawa, Ont.....	Sept. 30, '72	Feb. 23, '05	T.S. Branch, Dept. of Interior.
Fairchild, Charles Courtland..	Brantford, Ont.....	Feb. 21, '67	Feb. 20, '01	O.L.S.
Farncomb, Alfred Ernest.....	Edmonton, Alta.....	May 22, '73	Mar. 12, '02	O.L.S.
Fawcett, Thomas.....	Ottawa, Ont.....	Oct. 28, '48	Nov. 18, '76	O.L.S., D.T.S. Boundary Surveys, Dept. of Interior.
Fawcett, Adam.....	Gravenhurst, Ont.....		Feb. 22, '93	
Ferguson, George Hendry.....	Toronto, Ont.....	Jan. 20, '83	June 2, '09	
Findlay, Allan.....	Winnipeg, Man.....	Oct. 15, '80	Mar. 21, '08	
Fletcher, James Allan.....	Fletcher, Ont.....	Mar. 26, '89	May 18, '11	
Fontaine, Louis Elie.....	Levis, P.Q.....	Oct. 3, '68	Nov. 30, '92	
Francis, John.....	Portage la Prairie, M.	Dec. 22, '52	June 17, '75	M.L.S.
Galletly, James Simpson.....	Brooklin, Ont.....	Apr. 15, '88	May 18, '11	
Garden, James Ford.....	Vancouver, B.C.....	Feb. 19, '47	May 13, '80	B.C.L.S.
Garden, George H.....	Lethbridge.....		Apr. 14, '72	Deputy Surveyor for N.B.
Garden, Charles.....	Not known.....		Apr. 14, '72	Deputy Surveyor for N.B.



## APPENDIX No. 10.—Continued.

List of Dominion Land Surveyors who have been supplied with Standard Measures—Continued.

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Garner, Albert Coleman.....	S. Qu'Appelle, Sask.	Sept. 6, '78	May 27, '07	
Gauvreau, Louis Pierre.....	Not known.		Apr. 14, '72	
Gibbon, James.....	Vancouver, B. C.	June 25, '60	Feb. 12, '91	O. L. S.
Glover, Arthur Edward.....	Toronto, Ont.	Mar. 4, '87	Mar. 11, '11	
Gordon, Maitland Lockhart.....	Vancouver, B. C.		Feb. 18, '04	B. C. L. S.
Gordon, Robert John.....	Lethbridge, Alta.	June 18, '69	Mar. 12, '02	
Gore, Thomas Sinclair.....	Victoria, B. C.	.....1852	Apr. 19, '79	B. C. L. S.
Graham, John Robertson.....	Vancouver, B. C.	Apr. 18, '87	May 26, '10	
Gray, James Edward.....	Toronto, Ont.	Oct. 12, '81	Mar. 11, '11	
Green, Alfred Harold.....	Nelson, B. C.	Jan. 20, '79	Feb. 23, '05	B. C. L. S.
Green, Thomas Daniel.....	Ottawa, Ont.	Dec. 21, '57	May 19, '84	O. L. S.
Green, Frank Compton.....	Nelson, B. C.		May 8, '03	B. C. L. S.
Grover, George Alexander.....	Toronto, Ont.		Feb. 18, '04	
Hamilton, Charles Thomas.....	Vancouver, B. C.	July 29, '84	May 18, '11	
Hamilton, James Frederick.....	Lethbridge, Alta.	Apr. 4, '69	June 2, '69	
Harris, John Walter.....	Winnipeg, Man.	Feb. 26, '45	Apr. 14, '72	O. L. S., M. L. S., City Surveyor.
Harrison, Edward.....	Belleville, Ont.		May 14, '10	
Harvey, Charles.....	Kelowna, B. C.	May 5, '76	Feb. 17, '04	B. C. L. S.
Hawkins, Albert Howard.....	Listowel, Ont.	July 27, '62	Mar. 6, '06	
Heaman, John Andrew.....	Winnipeg, Man.	June 3, '75	July 15, '09	O. L. S.
Heathcott, Robert Vernon.....	Edmonton, Alta.	July 7, '81	May 13, '07	
Henderson, Walter.....	Not known.		Nov. 17, '83	
Herriot, George Henry.....	Souris, Man.	Feb. 23, '83	Sept. 18, '09	
Heuperman, Frederick Justinus.....	Calgary, Alta.	July 23, '87	Mar. 13, '11	
Heuperman, Lambertus Fred.....	Calgary, Alta.	Sept. 20, '81	Mar. 29, '10	
Hobbs, Wilfrid Ernest.....	Winnipeg, Man.	Mar. 12, '87	Mar. 5, '12	
Holcroft, Herbert Spencer.....	Toronto, Ont.	Sept. 4, '77	Feb. 18, '03	O. L. S.
Hopkins, Marshall Willard.....	Edmonton, Alta.	May 24, '61	Feb. 20, '01	O. L. S.
Hubbell, Ernest Wilson.....	Ottawa, Ont.	Nov. 5, '62	May 19, '84	Chief Inspector of Surveys, Topographical Surveys Branch, Dept. of Interior.
Inkster, Oluff.....	Edmonton, Alta.	Mar. 25, '85	May 18, '11	
James, Silas.....	Toronto, Ont.	June 19, '34	Apr. 14, '72	O. L. S.
Jephson, Richard Jermy.....	Brandon, Man.	Feb. 5, '54	May 12, '80	O. L. S., B. C. L. S.
Johnson, Alfred William.....	Kamloops, B. C.	Feb. 23, '74	Mar. 12, '02	B. C. L. S.
Keith, Homer Pasha.....	Edmonton, Alta.	Aug. 30, '85	Feb. 1, '11	
Kimpe, Maurice.....	Edmonton, Alta.	Jan. 17, '76	May 13, '07	
King, William Frederick.....	Dominion Observatory, Ottawa, Ont.	Feb. 19, '54	Nov. 21, '76	D. T. S. Chief Astronomer Dept. of Interior.
Kirk, John Albert.....	Summerland, B. C.	Jan. 9, '54	May 11, '80	O. L. S., B. C. L. S.
Kitto, Franklin Hugo.....	Dawson, Y. T.	Mar. 28, '80	Mar. 6, '08	
Klotz, Otto Julius.....	Dominion Observatory, Ottawa, Ont.	Mar. 31, '52	Nov. 19, '77	O. L. S., D. T. S., Astronomer, Dept. of Int.
Knight, Richard H.....	Edmonton, Alta.	June 7, '77	Feb. 18, '04	
Lang, John Leiper.....	Toronto, Ont.		Oct. 14, '08	
Latimer, Frank Herbert.....	Penticton, B. C.	May 23, '60	Nov. 13, '85	
Laurie, Richard C.....	Battleford, Sask.	Jan. 31, '58	April 27, '83	
Lawe, Henry.....	Ottawa, Ont.	Feb. 28, '38	April 14, '72	O. L. S., M. L. S., Topographical Surv. Branch Dept. of Interior.
Lemoine, Charles Errol.....	Ville Montcalme, P. Q.		Mar. 31, '82	Q. L. S.
Lendrum, Robert Watt.....	Strathcona, Alta.	July 24, '34	May 15, '80	O. L. S.
Lighthall, Abram.....	Vancouver, B. C.	Mar. 30, '78	Dec. 25, '09	
Lindsay, James Herbert.....	Regina, Sask.	Nov. 27, '82	May 18, '11	
Loneragan, Gerald Joseph.....	Buckingham, P. Q.	Oct. 8, '71	Feb. 28, '01	Q. L. S., Insp. of Surveys, Dept. of Interior.
Loucks, Roy Wm. Egbert.....	Saskatoon, Sask.	Oct. 31, '84	Mar. 1, '12	
Lumsden, Hugh David.....	Ottawa, Ont.	Sept. 7, '44	April 14, '72	O. L. S.
MacLennan, Alexander L.....	Toronto, Ont.	May 10, '78	Feb. 23, '05	
MacPherson, Charles Wilfrid.....	Dawson, Y. T.	Sept. 6, '71	Mar. 7, '00	O. L. S.



## SESSIONAL PAPER No. 25b

## APPENDIX No. 10.—Continued.

LIST of Dominion Land Surveyors who have been supplied with Standard Measures—Continued.

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Magrath, Charles Alexander...	Ottawa, Ont. ....	April 22, '60	Nov. 16, '81	B. A. Sc., O.L.S., B.C.L.S., D. T. S., Member International Waterways Commission.
Martindale, Ernest Smith.....	Kingsmill, Ont. ....	May 20, '86	Mar. 11, '11	
Martyn, Oscar William.....	Mitchell, Ont. ....	Dec. 2, '88	Mar. 11, '11	
Matheson, Hugh.....	Ottawa, Ont. ....	May 2, '79	May 9, '11	
Meadows, William Walter.....	Maple Creek, Sask. ....	May 27, '73	Feb. 23, '05	O. L. S.
Miles, Charles Falconer.....	Toronto, Ont. ....	Jan. 30, '38	Apr. 14, '72	O.L.S. Inspector of Surveys, Dept. of Interior.
Mitchell, Benjamin Foster.....	Calgary, Alta. ....	June 16, '80	April 16, '08	A. L. S.
Moberly, Harford Kenneth.....	Moosomin, Sask. ....	— '69	April 21, '03	
Molloy, John.....	Winnipeg, Man. ....	Jan. 13, '40	April 14, '72	M. L. S.
Montgomery, Royal Harp.....	Prince Albert, Sask. ....	May 20, '82	Feb. 23, '05	O. L. S.
Moore, Herbert Harrison.....	Calgary, Alta. ....	Dec. 1, '69	Feb. 17, '04	
Morrier, Joseph Eldedge.....	Prince Albert, Sask. ....	Aug. 29, '74	May 16, '07	
McArthur, James Joseph.....	Ottawa, Ont. ....	May 9, '56	April 17, '79	Boundary Survey, Dept. of Interior.
McCaw, Robert Daniel.....	Sidney, B. C. ....	May 24, '83	Mar. 23, '09	
McColl, Gilbert Beebe.....	Winnipeg, Man. ....	Oct. 8, '82	Mar. 20, '07	M.L.S., D.T.S.
McColl, Samuel Ebenezer.....	Winnipeg, Man. ....	July 17, '86	May 18, '11	
McDiarmid, Stuart Stanley.....	Vancouver, B. C. ....	Aug. 4, '81	Feb. 23, '05	B.C.L.S.
McEwen, Duncan Findlay.....	Edmonton, Alta. ....	Aug. 7, '73	May 18, '11	
McFadden, Moses.....	Vancouver, B. C. ....	Aug. 26, '26	April 14, '72	O.L.S., M.L.S.
McFarlane, Walter Graham.....	Toronto, Ont. ....	Sept. 28, '75	May 19, '05	
McFarlane, John Baird.....	Toronto, Ont. ....	Feb. 25, '79	June 3, '08	
McFee, Angus.....	Red Deer, Alta. ....	July 14, '46	April 19, '79	
McGeorge, William Graham.....	Chatham, Ont. ....	Mar. 22, '87	Mar. 21, '10	
McGrandle, Hugh.....	Wetaskiwin, Alta. ....	Mar. 12, '57	Mar. 30, '83	O.L.S.
McKenzie, John.....	New Westminster, B. C. ....	Oct. 31, '47	Nov. 18, '87	
McLean, James Keachie.....	Ottawa, Ont. ....	Dec. 19, '51	April 1, '82	O.L.S. Dept. of Indian Affairs.
McMaster, William Angus Alexander.....	Palmerston, Ont. ....	Feb. 1, '85	July 6, '10	
McMillan, George.....	Finch, Ont. ....	Dec. 9, '69	Feb. 22, '06	
McNaughton, Alexander L.....	Cornwall, Ont. ....	Sept. 30, '81	Feb. 23, '05	O.L.S., B.C.L.S.
McPherson, Archibald John.....	Regina, Sask. ....	— '70	Feb. 21, '01	
McPhillips, George.....	Winnipeg, Man. ....	April 26, '48	June 17, '75	O.L.S., M.L.S.
McPhillips, Robert Charles.....	Winnipeg, Man. ....	April 24, '56	May 17, '80	
McVittie, Archibald W.....	Victoria, B.C. ....	May 5, '58	Mar. 30, '82	B.C.L.S.
Nash, Thomas Sanford.....	Ottawa, Ont. ....	July 2, '75	Feb. 18, '04	Topographical Surveys Branch, Dept. of Inter.
Neville, Everett A.....	Ruthven, Ont. ....	Jan. 8, '87	May 18, '11	
Ogilvie, William.....	Ottawa, Ont. ....	April 7, '46	April 14, '72	O.L.S.
O'Hara, Walter Francis.....	Ottawa, Ont. ....	—	Feb. 19, '95	O.L.S.
Ord, Lewis Redman.....	Hamilton, Ont. ....	Oct 17, '56	April 1, '82	O.L.S.
Palmer, Philip Ebenezer.....	Dorchester, N.B. ....	Mar. 6, '88	Mar. 7, '12	
Parsons, Johnstone Lindsay R.....	Regina, Sask. ....	Jan. 18, '76	Feb. 23, '05	O.L.S.
Patrick, Allan Poyntz.....	Calgary, Alta. ....	July 18, '49	Nov. 19, '77	B.C.L.S., D.T.S.
Patten, Thaddeus James.....	Little Current, Ont. ....	Feb. 4, '59	Mar. 29, '83	O.L.S.
Pearce, William.....	Calgary, Alta. ....	Feb. 1, '48	May 10, '80	O.L.S., B.C.L.S.
Pearce, Seabury Kains.....	Calgary, Alta. ....	Dec. 6, '87	Mar. 9, '11	
Pequegnat, Marcel.....	Berlin, Ont. ....	April 27, '86	June 6, '10	
Peters, Frederic Hatheway.....	Calgary, Alta. ....	Nov. 4, '83	Mar. 4, '10	Commiss'er of Irrigation.
Phillips, Edward Horace.....	Saskatoon, Sask. ....	Dec. 19, '78	Feb. 24, '02	
Phillips, Harold Geoffrey.....	Saskatoon, Sask. ....	Sept. 3, '87	April 23, '10	
Pierce, John Wesley.....	Ottawa, Ont. ....	—	Dec. 24, '09	
Plunkett, Thomas Hartley.....	Meaford, Ont. ....	June 1, '78	Mar. 12, '08	
Ponton, Archibald William.....	Edmonton, Alta. ....	Jan. 25, '59	May 18, '81	O.L.S.
Powell, William Henry.....	Vancouver, B.C. ....	Dec. 22, '84	Feb. 22, '11	
Proudford, Hume Blake.....	Saskatoon, Sask. ....	June 23, '58	Mar. 28, '82	O.L.S.
Purser, Ralph Clinton.....	Windsor, Ont. ....	April 7, '86	Feb. 2, '11	



## APPENDIX No. 10.—Continued.

## LIST of Dominion Land Surveyors who have been supplied with Standard Measures—Continued.

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Rainboth, Edward Joseph...	Ottawa, Ont. ....	.....	May 19, '81	Q.L.S., O.L.S.
Ransom, John Thomas. ....	Toronto, Ont. ....	Aug. 24, '88	Jan. 14, '11	
Reilly, William Robinson...	Regina, Sask. ....	Aug. 10, '57	Nov. 17, '81	O.L.S., M.L.S.
Richard, Joseph Francois....	Ste. Anne de la Po- catière, P.Q. ....	.....	May 13, '82	
Rinfret, Claude. ....	Montreal, P.Q. ....	Jan. 5, '86	Mar. 20, '08	Q.L.S.
Rinfret, Raoul. ....	Montreal, P.Q. ....	July 16, '56	Feb. 20, '60	Q.L.S.
Ritchie, Joseph Frederick...	Prince Rupert, B.C. ....	May 23, '63	Jan. 7, '89	B.C.L.S.
Robertson, Henry H. ....	N. Timiskaming, P.Q. ....	Sept. 13, '47	April 14, '72	Q.L.S.
Roberts, Sydney Archibald...	Victoria, B.C. ....	April 10, '48	May 16, '85	B.C.L.S.
Roberts, Vaughan Maurice...	Goderich, Ont. ....	Mar. 22, '64	May 17, '86	
Robinson, Ernest Walter P.	Ottawa, Ont. ....	May 8, '80	May 1, '08	
Robinson, Franklin Joseph...	Regina, Sask. ....	Oct. 20, '70	Feb. 20, '00	Deputy Minister of Public Works.
Rolfson, Orville. ....	Walkerville, Ont. ....	Feb. 26, '85	July 11, '08	
Rombough, Marshall Bedwell	Morden, Man. ....	Oct. 14, '35	April 14, '72	M.L.S.
Rorke, Louis Valentine ....	Toronto, Ont. ....	Feb. — '65	Aug. 13, '91	O.L.S. Inspector of Sur- veys for Ontario.
Ross, George. ....	Welland, Ont. ....	June 12, '53	Nov. 21, '82	O.L.S.
Ross, Joseph Edmund. ....	Kamloops, B.C. ....	Jan. 9, '61	Feb. 12, '91	O.L.S., B.C.L.S.
Routly, Herbert Thomas. ....	Haileybury, Ont. ....	Jan. 20, '38	Feb. 15, '11	
Roy, George Peter. ....	Quebec, P.Q. ....	Oct. 1, '52	Nov. 17, '81	Q.L.S.
Roy, Joseph George Emile...	Quebec, P.Q. ....	Mar. 14, '86	May 25, '10	
Saint Cyr, Jean Baptiste...	Montreal, P.Q. ....	Dec. 17, '68	Feb. 17, '87	Q.L.S.
Saint Cyr, Arthur. ....	Ottawa, Ont. ....	Nov. — '60	Feb. 17, '87	
Saunders, Bryce Johnston...	Edmonton, Alta. ....	Oct. 17, '60	Nov. 16, '84	O.L.S.
Scott, Walter Alexander...	Galt, Ont. ....	Aug. 8, '85	Mar. 9, '09	
Seager, Edmund. ....	Kenora, Ont. ....	Nov. 22, '38	April 14, '72	O.L.S.
Sewell, Henry DeQuincy. ....	Toronto, Ont. ....	April 18, '48	May 16, '85	O.L.S.
Seymour, Horace Llewellyn...	Edmonton, Alta. ....	June 11, '82	Feb. 22, '06	O.L.S.
Shaw, Charles Aeneas. ....	Greenwood, B.C. ....	Nov. 16, '53	May 10, '80	O.L.S., B.C.L.S.
Shpley, Joseph Drummond...	N. Battleford, Sask. ....	Sept. 13, '79	Mar. 12, '06	
Smith, Charles Campbell...	Ottawa, Ont. ....	Jan. 1, '73	Feb. 22, '06	O.L.S.
Smith, Donald Alpine. ....	Claude, Ont. ....	Sept. 22, '80	April 21, '10	
Smith, James Herbert. ....	Edmonton, Alta. ....	Nov. 9, '76	Feb. 23, '05	
Soars, Henry Martin Robinson	Edmonton, Alta. ....	April 22, '77	Nov. 2, '08	
Speight, Thomas Bailey. ....	Toronto, Ont. ....	Feb. 8, '59	Nov. 16, '82	O.L.S.
Starkey, Samuel M. ....	Codys, N.B. ....	Sept. 4, '37	April 14, '72	
Steele, Ira John. ....	Ottawa, Ont. ....	April 6, '81	April 16, '08	
Stewart, Elihu. ....	Collingwood, Ont. ....	Nov. 17, '44	April 14, '72	O.L.S.
Stewart, Lionel Douglas N.	Collingwood, Ont. ....	.....	Jan. 27, '10	
Stewart, Will Malcolm. ....	Saskatoon, Sask. ....	Nov. 26, '84	June 6, '07	
Stewart, Louis Beaufort. ....	Toronto, Ont. ....	Jan. 27, '61	Nov. 22, '82	O.L.S., D.T.S. Profes- sor of Surveying and Geodesy, University of Toronto.
Stewart, Alexander George...	Ottawa. ....	Aug. 16, '87	Mar. 14, '10	
Stewart, George Alexander...	.....	.....	April 14, '72	O.L.S.
Stock, James Joseph. ....	Ottawa, Ont. ....	Aug. 16, '87	Mar. 2, '10	
Street, Paul Bishop. ....	Toronto, Ont. ....	Dec. 3, '81	Mar. 29, '10	
Stuart, Alexander Graham...	Buckingham, P.Q. ....	July 16, '88	May 9, '11	
Summers, Gordon Foster. ....	Haileybury, Ont. ....	.....	Oct. 20, '10	
Taggart, Charles Henry ....	Ottawa, Ont. ....	.....	May 9, '11	
Talbot, Albert Charles. ....	Calgary, Alta. ....	April 5, '56	May 13, '80	
Taylor Alexander. ....	Portage la Prairie, Man. ....	.....	.....	
Taylor, William Emerson...	Owen Sound, Ont. ....	Aug. 3, '81	Dec. 16, '10	M.L.S.
Teasdale, Charles Montgomery	Concord, Ont. ....	Oct. 18, '79	Mar. 9, '06	
Thompson, William Thomas...	Grenfell, Sask. ....	Nov. 1, '53	Nov. 19, '77	D.T.S.
Tipper, George Adrian. ....	Brantford, Ont. ....	July 25, '86	May 18, '11	
Tracy, Thomas Henry. ....	Vancouver, B.C. ....	June 23, '48	April 14, '72	O.L.S., B.C.L.S.
Tremblay, Alfred Joseph....	Les Eboulements, P.Q. ....	.....	Feb. 18, '90	



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APPENDIX No. 10.—*Continued.*

LIST of Dominion Land Surveyors who have been supplied with Standard Measures—*Continued.*

Name.	Address.	Date of birth.	Date of Appointment or of Commission.	Remarks.
Tremblay, Albert Jacques....	Edmonton, Alta.....	July 25, '87	Mar. 1, '12	
Turnbull, Thomas.....	Winnipeg, Man.....	May 26, '57	Mar. 29, '82	O. L. S.
Tyrrell, James William....	Hamilton, Ont.....	May 10, '63	Feb. 16, '87	O. L. S.
Underwood, Joseph Edwin....	Saskatoon, Sask.....	Nov. 3, '82	May 18, '11	
Vaughan, Josephus Wyatt....	Vancouver, B. C.....	Oct. 17, '45	June 11, '78	B. C. L. S.
Vicars, John Richard Odium.	Kamloops, B. C.....	April 16, '55	May 17, '86	O. L. S., B. C. L. S.
Waddell, William Henry....	Edmonton, Alta.....	Mar. 23, '83	Mar. 25, '07	O. L. S.
Waldron, John.....	Moosejaw, Sask.....	Aug. 1, '72	April 2, '07	
Walker, Claude Melville....	Guelph, Ont.....	Oct. 16, '84	Mar. 11, '11	
Wallace, James Nevin.....	Calgary, Alta.....	Aug. 21, '70	Feb. 20, '00	O. L. S.
Warren, James.....	Walkerton, Ont.....	Nov. 7, '37	April 14, '72	
Watt, George Herbert.....	Ottawa, Ont.....	Feb. 5, '76	Feb. 24, '02	
Weekes, Abel Seneca.....	Edmonton, Alta.....	Feb. 17, '66	Feb. 11, '92	
Weekes, Melville Bell.....	Regina, Sask.....	Nov. 28, '74	Feb. 18, '03	O. L. S.
Wheeler, Arthur Oliver.....	Sidney, B. C.....	May 1, '60	Nov. 21, '82	O. L. S., B. C. L. S.
White-Fraser, George W. R. M.	Ottawa, Ont.....	— '61	Feb. 21, '88	D. T. S.
Wiggins, Thomas Henry....	Saskatoon, Sask.....	Aug. 24, '63	Feb. 18, '96	O. L. S.
Wilkins, Frederick W. B....	Norwood, Ont.....	June 27, '54	May 18, '81	O. L. S., D. T. S.
Wilkinson, William Downing	Not known.....	—	Feb. 22, '93	
Williams, Guy Lorne.....	Enderby, B. C.....	Mar. 3, '79	June 24, '08	B. C. L. S.
Wilson, Reginald Palliser....	Winnipeg, Man.....	July 9, '72	Jan. 26, '11	M. L. S.
Woods, Joseph Edward.....	Pincher Creek, Alta....	Oct. 13, '61	Nov. 14, '85	
Young, Walter Beatty.....	Winnipeg, Man.....	July 6, '80	Mar. 25, '05	M. L. S.
Young, William Howard.....	Lethbridge, Alta.....	June 8, '78	May 17, '07	







# REPORTS OF SURVEYORS







**GENERAL REPORTS OF SURVEYORS**

1911-1912

**APPENDIX No. 11.****ABSTRACT OF THE REPORT OF J. R. AKINS, D.L.S.****SURVEY OF THE NORTH BOUNDARY OF THE PEACE RIVER BLOCK.**

We left Edmonton on March 1 with four pack ponies to a sleigh, each sleigh being loaded with about twenty-five hundred pounds. A team of heavy horses was purchased at Athabaska Landing to assist the pack ponies in rough places, and many times they proved indispensable. Dunvegan was reached on March 23, but the ice was then considered unsafe and the freighters would not risk their horses on it. It was accordingly decided to take the overland route. For a distance of about twenty-five miles north of Dunvegan the country is nearly open, and the ground was almost bare of snow, but north of that in the woods the snow was very deep. The weather again turned cold, and a crust formed on the snow so hard that some of the freighters refused to go farther and accordingly went back. On April 15 it turned warm and wagons had to be used for transport in the open and sleighs in the bush. Boundary lake was reached on April 28, and the following day search was made for the old monuments on the twenty-second base which was the initial point of our survey. These monuments, though placed there twenty-eight years ago, were found with little difficulty, and the east outlines of townships 85, 86, 87 and 88 were run north to the twenty-third base line, which is the north boundary of the Peace River block at the northeast corner.

The survey of the north boundary of the block was begun on May 29, and notwithstanding the extremely wet weather the northwest corner of the block was reached on September 23, a distance of one hundred and two miles being run, mostly through wooded country and heavy timber.

On reaching the northwest corner of the block I learned that Mr. L. Brenot, D.L.S., required assistance to enable him to complete the survey of the west boundary before the cold weather would set in, so we moved south to meet him and the two parties completed the west boundary on October 12.

I then moved to the northeast corner of the block and produced the twenty-third base easterly. The line runs along the top of the Clear hills for about thirty miles, and because no horse feed grows on these hills much difficulty was experienced in transportation. The last camp on the line was supplied by man-packing, so that after completing twenty-two miles we were compelled to quit work as the nearest horse feed (which was only frozen grass) was ten miles from the base line.

A sleigh road was made from the Fort St. John trail to the Clear hills to intersect the base line and a cache was built to store the supplies which we left. As the snow was getting deep and the rivers frozen, we closed operations and left for Edmonton arriving there on January 7.

The portion of the Peace River block lying north of Peace river has splendid soil, and though the season is short, the growth is rapid and very luxuriant. About twenty-five per cent. of the country is open, the open part lying chiefly along Peace and Pine rivers. Grass and pea-vine grow in abundance. Although the Indians put up no hay for their horses, allowing them to run all winter, a rancher would have to put up feed for his stock for at least three months in the year and sometimes longer. Hay can be obtained in the flats and good feed can be got by cutting the grass on the uplands.



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The climate along the north boundary of the block is not suitable for grain growing. This is no doubt due to the many muskegs through which the line runs and the large ones in close proximity to the line, as nearer the river the climate is very different, and at Fort St. John vegetables are grown successfully.

Considerable timber grows in the northeast part of the block but the quality is not first class, being composed of spruce, poplar, and jackpine. A large quantity of pulp-wood could be obtained.

The only mineral seen was outcrops of coal on Doig river. Sandstone suitable for building purposes was found on Pine and Doig rivers.

Game is rather scarce north of Pine river as it is hunted by the Beaver Indians, but moose, bears, and caribou are to be found. Grouse of several varieties are very plentiful and the streams contain many kinds of fish including grayling and different kinds of trout.





*Photo by J. R. Akins, D.L.S.*

Looking East on the Twenty-Third Base Line, Range Fourteen, West of the Sixth Meridian.







## APPENDIX No. 12.

## ABSTRACT OF THE REPORT OF C. F. AYLSWORTH, D.L.S.

## MISCELLANEOUS SURVEYS IN MANITOBA AND SOUTHERN SASKATCHEWAN.

My first work of the season was the survey of a summer resort on Arbor island in Max lake, which is situated in township 1, range 20, west of the principal meridian in the Turtle Mountain forest reserve. The surface of the island is undulating and is about ten feet above the water of the lake. The beach is sandy while the lake abounds with all kinds of fish. A good road leads to the lake from Boissevain in township 3, range 20. An old-settled agricultural district lies between Boissevain and Max lake. Wheat raising is the principal industry followed in this district but there is sufficient mixed farming to meet the domestic demand. The prosperity of the district is shown by the good farm buildings, churches, schools and roads.

The forest growth in the Turtle Mountain reserve is greatly retarded by the fires which sweep over it. These fires get beyond control of the fire rangers and destroy not only the growing timber, but also the alluvial soil on the surface, thus retarding future vegetation.

Having completed the subdivision at Max lake, we left on May 24 for Moose mountain where our next work lay, passing through Deloraine, Napinka, Redvers and Cannington Manor. We found good roads all the way. The districts around Deloraine and Napinka are among the oldest settled portions of Manitoba and possess soil of the best fertility. From Napinka to Cannington Manor, settlement is of more recent date, but it is improving rapidly. From Cannington Manor to Fish lake there are good roads during dry seasons, but they are hilly, and during wet seasons are very heavy.

We reached Fish lake on section 15, township 10, range 3 west of the second meridian on June 1 and performed the subdivision surveys required in several summer resorts surrounding the lake. Fire has not done any damage in the Moose Mountain forest reserve in which this lake is situated, and the timber and scrub are all growing luxuriantly. There are roads through the mountains leading to Fish lake from Old Cannington Manor, Carlyle and Arcola. Fish lake is a fairly large body of water surrounded by sandy beaches and contains many varieties of fish.

Having finished the surveys at Fish lake on July 13 we left the following day for Tyndall to retrace the east and south boundaries of St. Peter's Indian reserve across townships 13, 14, and 15, range 6, east of the principal meridian. On section 10 of township 13 is the Garson limestone quarry which employs about 100 men. The surface stone throughout this township is limestone and the land, though hard to clear of stones, is very productive, growing heavy crops of wheat, oats and vegetables. In townships 14 and 15 the land is somewhat lower, but the soil is of a superior quality.

This work having been completed we closed our survey operations for the season on November 21.



## APPENDIX No. 13.

## ABSTRACT OF THE REPORT OF P. R. A. BELANGER, D.L.S.

## MISCELLANEOUS SURVEYS AND INSPECTION OF CONTRACTS IN MANITOBA AND SASKATCHEWAN.

After organizing my party at Winnipeg I proceeded to Pointe-du-Bois whence we travelled up Winnipeg river, partly on the ice and partly by boat, arriving at the place of my first work on April 20, 1911.

The surveys to be made here consisted of subdivision and traverses in township 16, range 16, and townships 15 and 16, range 17, east of the principal meridian.

The country covered by these surveys may be described as a rough, rocky, timbered country broken by tamarack and spruce swamps and numerous lakes. Some good farming land, however, can be found in scattered pieces along Winnipeg river, principally along the south bank in range 16, in a timber limit. Some of the islands would also make fine farms, but the whole is heavily timbered.

Large game, and fish such as pike, pickerel and sturgeon, are abundant.

Winnipeg river averages from thirty to fifty chains in width and is very deep. It affords the only practicable route for transportation across the country, and, from Pointe-du-Bois where it has been dammed, now forms a smooth sheet of water over forty feet deep, extending about nine miles northeast to Lamprey falls which, owing to the effect of the dam, have entirely disappeared. From there easterly, with the exception of three or four short stretches of swift water, the current is slow and the river is easily ascended with canoes or rowboats up to the Ontario boundary. Since the building of the dam a moderate-sized boat may run from Pointe-du-Bois right to the Ontario boundary.

At present this country may be reached by travelling from Winnipeg to Lac-du-Bonnet via the Canadian Pacific railway, from there to Pointe-du-Bois via the Winnipeg City Power railway, and thence by boat up the river. It may also be reached from Kenora travelling by boat down the river, but this route is unsuitable, as several portages have to be made to avoid dangerous falls and rapids.

Lumber is still the chief asset of this district. A large percentage of the timber has already been destroyed by fires, but what is left is suitable for all purposes, from first-class lumber to ties, posts and poles, there being also an abundance of pulp-wood and cord-wood. This timber is all in close proximity to the banks of the river, or is on islands and therefore easily accessible.

I found numerous traces of mica on the river banks which, for the most part, are rocky, and also in the interior three miles north of the river, but did not come across any large veins.

The city of Winnipeg has now finished the construction of an immense power plant by the damming of Pointe-du-Bois falls and has developed energy amounting to over 100,000 horse-power.

From Pointe-du-Bois I proceeded *via* Winnipeg to Oak Point settlement where I secured my horses and drove to my second work at Fisher River settlement. The work here consisted of the inspection of Mr. Tyrrell's contract No. 2 of 1910 and the survey of a small settlement called Fisher Bay.

This settlement is situated on the west shore of Fisher bay, from which it derives its name, and the bay itself forms part of lake Winnipeg. The settlement is very small and comprises only ten lots which are all occupied by half-breed fishermen coming from Fort Churchill, Oxford House, Norway House and Cross lake. The land they occupy is very good for mixed farming but, with the exception of marshes at the



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western end of the settlement and small cleared openings near the shore of the lake, it is heavily timbered. Fisher Bay settlement is accessible by boat from all points on lake Winnipeg. There is also a wagon road which leads to Fisher river, and from there roads lead south, east and west. These roads, however, need to be greatly improved before there can be any heavy traffic over them.

From Fisher Bay I drove to Oak Point settlement through the new St. Peter's Indian reserve on Fisher river, and through numerous settlements. All along the way I was agreeably surprised to see the wonderful change that has taken place since my last trip through that country in 1910. There are still, however, large tracts of vacant land in the vicinity of Island lake where cattle raising and dairying could be profitably carried on.

My next work was the inspection of survey contracts east of Prince Albert. I first examined Mr. Teasdale's contract covering townships 44 to 48, range 11, west of second meridian. I reached this work by following a lumber road from the railway siding to the lumber camp, situated near the north boundary of township 45, and from there by an old pack-trail as far as the centre of township 46, but farther north pack-horses had to be used. A wagon road can be easily made along this pack-trail, which, in this range, leads in a northerly direction to Carrot river near the north boundary of township 48. The country covered by this contract is generally rolling and, with little exception, is heavily timbered, part of the timber being included in the timber berth covering the north half of township 45 and the south half of township 46. The land is first class, but it needs to be cleared before it can be settled.

Returning to Peesane I proceeded southerly from the railway siding to Mr. Ransom's contract No. 5 of 1911, covering townships 39 and 40, ranges 4, 5, 6 and 7, west of the second meridian, but inspected only a portion of it as the whole contract was not completed.

My next work was the inspection of Mr. Stewart's contract No. 8 of 1911, situated north of Carrot river, in range 11. To reach this work I went north to Tisdale, a thriving town on the Canadian Northern railway, and from there followed the main road passing through Forester, New Osgoode, and Arborfield. The two first-named places are thickly settled; the last-named one is comparatively new, though very promising, and as soon as the land is opened, this settlement will compare favourably with the others. The land is first class but the great drawback to all these settlements is the want of a sufficient number of machines to thresh the grain; this shortage proved ruinous to numerous farmers whose grain was not yet threshed in December and was under snow for the winter.

Leaving Arborfield I followed Carrot river for a few miles to Mr. Stewart's contract comprising townships 49 to 53, range 11. The surface of these townships is flat and covered with a thick growth of small poplar and willow which keeps it wet. The only trail in the interior of the townships is the surveyors' trail which leads northerly to Saskatchewan river.

Large game, such as moose and deer, is very plentiful, while partridges and prairie-chickens are also abundant in the whole district. No minerals of any kind were found.

Having completed the inspection of all the contract surveys in the Carrot river district that were ready for inspection, I returned to Tisdale and, on December 2, left for Gypsumville, reaching there on the 6th. Here my work consisted of the inspection of Mr. Pequegnat's contract No. 3 of 1911 and the performance of some retrace-ment and resurvey work in townships 31 and 32, range 9, and township 33, range 8, west of the principal meridian.

The country covered by this contract is for the greater part unfit for settlement at the present time, though some good homesteads suitable for mixed farming are found. The chief drawback is the lack of roads, but besides this inconvenience the land is heavily covered with bush of different kinds. On the other hand, the fact



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that Gypsumville lies in township 32, range 9, and is the present terminus of the Oak Point branch of the Canadian Northern railway, where the famous gypsum mines are worked to so much advantage, should be an inducement to settlers to seek land in that direction.

It is hardly credible that similar country crossed by the railway from Oak Point to Gypsumville, which only a few years was considered chiefly unfit for settlement, is now mostly settled and has thriving villages at every station along the line.

Gypsumville is still only a small village composed of a first-class general store where the post-office is kept, a boarding house and a few houses, all owned by the Gypsum company who use them for their employees. It is situated within twenty chains of the mines in section 26, township 32, range 9.

Gypsum is also found at a short distance east and southeast of Gypsum lake in township 33, range 8, but the mine has not been worked yet. Good spruce timber is available in township 33, range 8, and the lumber intending settlers may require will be easily obtained here. This township is reached by the road from lake St. Martin from which there is also a road leading to Gypsumville.



## APPENDIX No. 14.

## ABSTRACT OF THE REPORT OF G. A. BENNETT, D.L.S.

## MISCELLANEOUS SURVEYS IN SASKATCHEWAN AND ALBERTA.

My first work was the survey of the dry bed of a lake in township 10, range 11, west of the second meridian, the dry bed of Grassy lake in townships 9 and 10, ranges 10 and 11, and the bed of a lake nearly dry in township 9, range 10. The settlers in this district are progressive and prosperous. Large farm buildings and handsome houses have replaced the sod stable and shack while six-horse teams or traction engines are used for breaking the land. Hay was formerly obtained from the dry lake beds, but these are rapidly being cultivated and are found to produce excellent crops of wheat and flax. Drinking water is scarce and small towns find difficulty in procuring an adequate supply of good quality.

I next retraced some lines in townships 10 and 11, range 19, in townships 7 and 8, range 15, and in township 8, range 16. I also placed monuments defining the west boundary of township 20, range 17, along Indian reserve No. 75. This latter district is partly covered by bluffs of poplar and willow. Although the land was homesteaded many years ago little effort has been made to increase the small natural patches of prairie. The area of cultivated land, is therefore, somewhat limited but as no damage results from hail or frosts, a fair living is made by the farmers.

On June 24 I began the traversing of the right bank of South Saskatchewan river and the resurvey of lands along the river in township 25, range 5, and township 19, range 15, west of the third meridian. This resurvey proved so extensive, as no monument of the original survey could be found near the river, that the work was not entirely completed. The land in the valley will not prove valuable wheat land but vegetables and small fruits grow well. Irrigation will be necessary to obtain the best results but water for this purpose is easily obtained from the small streams flowing into the river.

A retracement survey in township 13, range 4, and a verification survey of islands in Johnston lake was the next work, and on August 15, I began the examination of the survey of townships 13 and 16, range 14, and township 16, range 13, in which large errors in the original survey were found.

From there I proceeded to Rosetown *via* Saskatchewan Landing and retraced erroneous lines in township 19, range 15, and township 26, range 20. Dry lake beds were resurveyed in townships 27 and 28, ranges 14 and 15, township 26, range 23, and township 33, range 26.

This tract of apparently semi-desert known as 'the great plains' has become the home of thousands of progressive and enterprising farmers. Grain growing is carried on extensively, and breaking at the rate of thirty acres per day, is being done with gasoline traction engines. Some idea of the extensive scale on which operations are being carried on may be gathered from the fact that one farmer ordered thirty new binders to harvest his crop this year.

Surveys of dry lake beds were also made in township 11, range 4, townships 14 and 15, ranges 3 and 4, and township 18, range 26. Partially dry lake beds were also surveyed in townships 14 and 15, range 10, and township 18, range 26. A traverse was made of Ghost Pine lake in townships 36, ranges 24 and 25, all west of the fourth meridian.



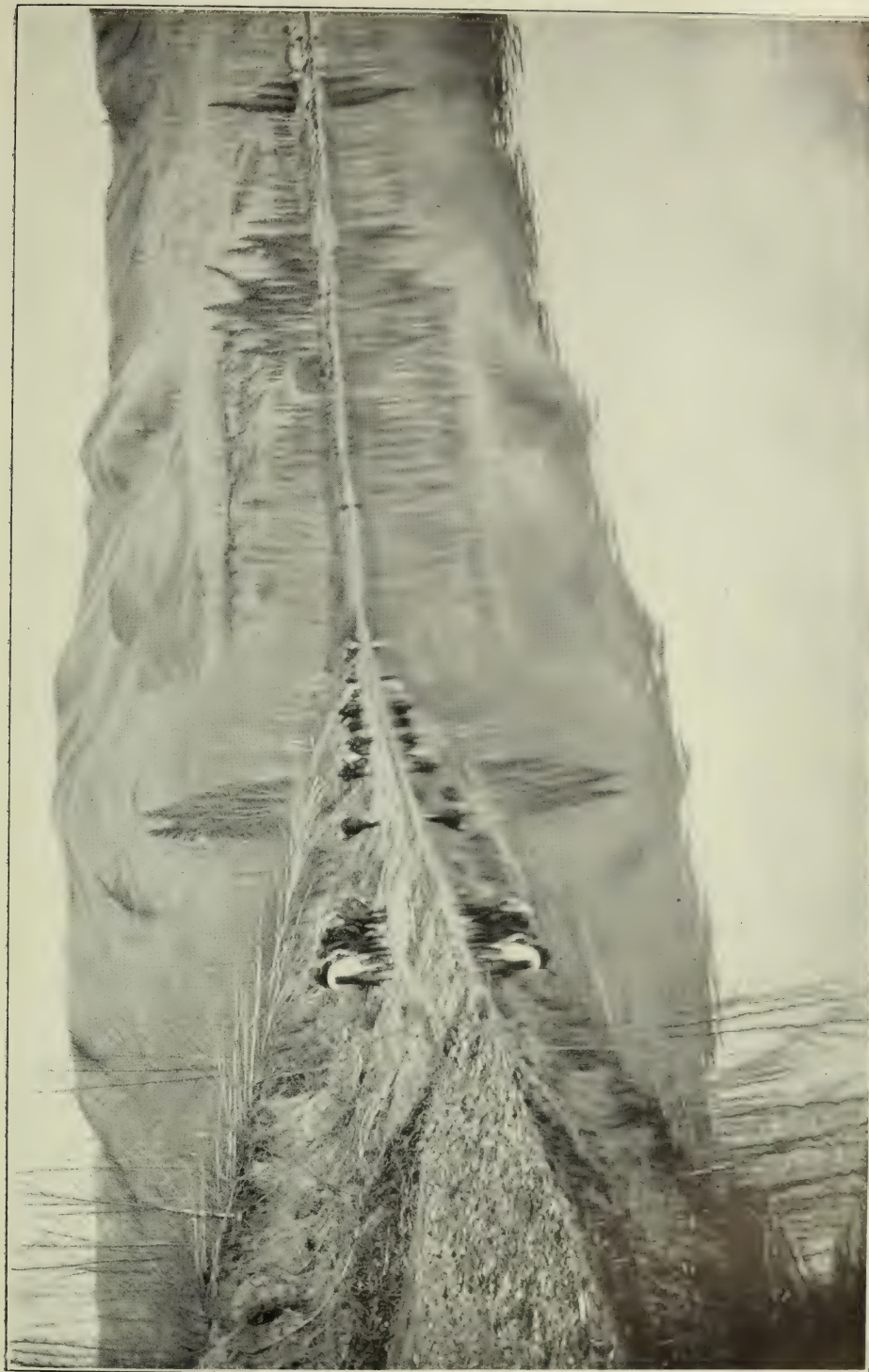
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The probable factor affecting the variation of the level of the lakes appears to be the increase or decrease of the permeability of the surrounding soil in the depressions. It was observed that when large areas were plowed up near the lake basin the volume of water was much lessened. Fire also is an active agent as it destroys the impervious layer of peaty matter found in the lake bottoms whenever the lake becomes sufficiently dry. Lakes in the prairie were found drying up, while lakes in the bush country were larger than when originally surveyed.

Erroneous lines were retraced in township 21, range 1, townships 10 and 11, range 5, townships 10, ranges 6 and 10, and township 8, range 21. A traverse of Little Bow river was made in township 14, range 21, all west of the fourth meridian.

The surveying season was unusually cold and wet. Frost occurred on August 25 and the continued wet weather rendered threshing so difficult that on December 11, the date of closing survey operations, thousands of acres of grain on the prairie were still in the stook.





*Photo by J. B. Aldrin, D.L.S.*

Pack Train along Pine River—Peace River Block.







## APPENDIX No. 15.

## ABSTRACT OF THE REPORT OF G. H. BLANCHET, D.L.S.

## SURVEY OF THE TWENTY-THIRD BASE BETWEEN THE FOURTH AND FIFTH MERIDIANS.

The starting point of our work was reached by sending the horses along the trail close to the fourth meridian, while the men and supplies went in scows on Athabaska river to McMurray and thence by Clearwater river to the fourth meridian.

Camp was pitched on June 10, 1911, three miles west of the fourth meridian, and, after turning off the base line and checking our starting point, the production of the line westerly was begun on June 17.

Through the first nine ranges the line follows very closely Clearwater river the general course of which is westerly. The valley of this river has an average depth of about six hundred feet and is from two to three miles in width.

The northeast corner of section 36, township 88, range 1, is seventeen chains south of the top of the Clearwater valley. The valley here was formerly heavily timbered with spruce, balsam, birch and poplar. Much of this timber, however, has been destroyed by frequent fires which have swept most of the country back of the river valley.

For a distance varying from a few chains to several miles back from the river valley the country consists of fairly well-drained poplar and jackpine ridges and spruce swamp, but in general on both sides of the river beyond the direct drainage area afforded by it and its tributary streams the country is principally muskeg containing patches of jackpine and broken by occasional poplar ridges.

The base line runs into the valley on the north boundaries of section 34 and 35, range 1, the valley here containing some excellent spruce. It also passed within three-quarters of a mile of the Whitemud falls on Clearwater river in the northwest quarter of section 2, range 1. These falls are admirably situated for the development of power, being capable of producing about 3,500 horse-power.

Gypsy creek flows in a northwesterly direction across township 88, range 1, crossing the base line on the north boundary of section 31, where it has a considerable valley. Some good spruce is to be found along this valley while on either side are poplar and jackpine ridges.

Limestone outcrops in many places along this portion of Clearwater river render navigation impossible. The Cascade rapids occur about one mile north of the northeast corner of section 32, township 88, range 2. They form the head of navigation on Clearwater river. Below this point boats with a draught of four feet could find sufficient water if carefully navigated among the numerous sand-bars. A brief description of this river might be given here. The distance from its juncture with the Athabaska at McMurray to the Cascades corresponds to forty-seven miles by the base line and is probably sixty-five miles by the river. It discharges about five thousand cubic feet a second till joined by Christina river from the south in range 7. This increases its volume by about one-half. The current averages two and one-half miles an hour and the width of the river varies from six to twelve chains. Numerous islands, generally timbered, occur. The banks are about twelve feet high, being sufficient probably to prevent flooding on the flats. The valley is almost everywhere heavily wooded with spruce, poplar and birch, with a dense underbrush.

Mineral springs, chiefly salt and sulphur, occur in many places along the river. These indications of salt were confirmed at the oil prospect near McMurray where in boring they found a bed of salt several hundred feet thick. Salt marshes, some of considerable extent, occur along the river valley.



In range 2 the base line passes through a mixed country of poplar and jackpine, with muskeg to the south.

Edwin creek, flowing through a deep wooded valley, crosses the line on the north boundary of section 34, range 3. This stream has its source in the muskegs in township 87, range 1, and flows northwesterly, being joined by many small feeders, the whole forming an excellent drainage system for the country adjacent to it. Several salt springs were noticed in its valley and a very strong sulphur spring is located at its mouth.

The Highhill river flows into the Clearwater from the north in the westerly side of range 3. It is about sixty feet wide and has a fair flow of water, but is too much broken by rapids for ordinary navigation.

In range 4 the line runs through an extensive muskeg, a bay of which approaches the banks of the Clearwater on the north. To the southwest this muskeg extends almost to Christina river, while to the south and southeast it includes the swampy tract occupied by Gordon and Gypsy lakes. Most of this country may be made suitable for agriculture by drainage. The chief hindrance to natural drainage is the surface moss through which water percolates very slowly even on a considerable slope. At the same time this is one of Nature's best provisions for the conservation of moisture. This feature is noted throughout the north where in many cases the divide between two rivers is a muskeg, the seepage from which feeds the tributary streams of both rivers.

In range 5 the line runs down to Clearwater river following the valley of Cottonwood creek and crossing several salt marshes near the river. Exposures of tar sand and outcrops of impure lignite were observed here.

Through ranges 6, 7, 8 and 9, the line followed the river fairly closely. It was decided, therefore, to send the horses to McMurray and move camp by scow. This necessitated considerable hard climbing but was otherwise satisfactory and gave the horses a good rest and splendid feeding ground, the benefit of which was felt in the heavy work of the fall and winter.

The weather in the latter part of July and nearly all through August and September was very unsettled, scarcely a day passing without rain. This was unfortunate not only on account of the discomfort and delays caused, but the excessive precipitation kept the creeks and muskegs at very high water till freeze-up, making trail location very difficult. Besides, as the rainy season extended through the haying time it was almost impossible to put up hay.

In range 7 Christina river flows into the Clearwater from the south. It is a considerable stream having a flow of about two thousand cubic feet a second. Its course is too much broken by rapids for ordinary navigation although small scows can be tracked up. Its basin which extends to the south for over seventy-five miles is separated from that of the Athabaska by the Little Rocky mountains. An extensive burned area runs southwest from the mouth of Christina river, patches of prairie some several hundred acres in extent having been formed by these fires.

The soil in the Clearwater valley is almost everywhere good, the subsoil varying from clay to clay loam and sandy clay with a surface of from two to ten inches of black loam. It is for the most part heavily timbered, spruce predominating on the river flats and poplar on the higher slopes of the valley. The large timber and heavy underbrush should indicate good growing conditions.

On the north side of the Clearwater, near its mouth, the country back from the valley becomes higher and drier, good patches of spruce and jackpine being found far back from the river.

Between the Christina and Athabaska rivers the country is drained by two fairly large streams, Hangingstone creek and Cameron creek (formerly known as Horse creek). As these streams and their tributaries have deep valleys the country here is rough. It is for the most part covered with a well grown second-growth poplar.



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McMurray settlement is situated at the juncture of the Clearwater and Athabaska rivers in range 9, being about three miles north of the base line. This was an important post in the early Hudson's Bay days before the railway. Situated at the juncture of the two principal trade routes it naturally became the receiving depot for furs and the distributing point from which supplies brought here by the long water route from Winnipeg were sent to the various posts throughout the north. With the building of the Canadian Pacific railway the Winnipeg-McMurray water route was abandoned in favour of Edmonton and the Athabaska, and since then the importance of McMurray in the fur trade has been small, except as the head of steamboat navigation on the lower Athabaska. During the last few years, however, with the realization of the agricultural and commercial possibilities of northern Alberta, the admirable situation of McMurray with regard to the waterways, in addition to the water-powers, timber, tar sand, and the possibility of oil in its vicinity, has re-awakened interest in it. Last season three companies were engaged in boring for oil between McMurray and Fort McKay, forty miles down stream. The season's results were considered satisfactory. Telegraphic connection with Edmonton is urgently needed and a winter road would be a great boon to the district.

The banks of Athabaska river are steep and range from 400 to 600 feet high, but below the juncture with the Clearwater the valley widens out forming extensive flats generally well wooded. Numerous islands occur in the river.

From its crossing in range 10 to range 17, the base line gradually diverged from the Athabaska, being about twenty miles north of it in the latter range. The country passed through was characteristic of the Athabaska country which might be generalized as follows. The strip adjacent to the river valley having a width of half a mile to several miles is well drained by numerous small streams, whose deep valleys as they approach the river make the country bordering the river valley extremely rough. This strip is generally well timbered where not fire-swept. Continuing back from the river muskegs are encountered in increasing number and extent till finally the country becomes muskeg, broken by islands and ridges of poplar and jackpine. As in the Clearwater district, there are no serious physical obstacles hindering drainage and usually the swampy surface is comparatively shallow. The surface moss is a poor conductor of heat so that the ice formed beneath it during the winter melts very slowly in the summer, thus preventing the country from drying up.

Two fairly large streams flow into the Athabaska from the north, one in range 10 and the other in range 14. This latter rises in several lakes in township 88, range 15, about which there are extensive hay meadows. The scarcity of horse feed made it necessary to start feeding oats on September 15, and on October 15 it was considered advisable to send out all the horses except the eight required for winter work. Transportation between the departure of the horses and the freeze-up, when we could use sleighs, was difficult. Heavy frosts occurred early in November freezing the muskegs sufficiently to bear the horses. This happened rather providentially as we were then camped on a point with burnt muskeg extending for miles on all sides except the east.

In range 15 the line entered the Thickwood hills which are composed of a series of ridges having a general northeast and southwest course, separated from one another by strips of muskeg. They extend from Athabaska to McKay river.

Snowstorms on November 6 and 7 marked the beginning of winter, the thermometer dropping to 30° below zero. On November 9 I divided the party, sending six men and four horses back to the Athabaska river, now 30 miles away, to open the pack-trail into a sleigh road and to bring up two sleigh loads of oats and supplies. Meanwhile the remainder of the men and horses I left to open up a trail to a cache at the Brule rapids on the Athabaska and to locate if possible some hay which an Indian was to have put up. Both parties encountered many difficulties and it was not till November 25 that the two parties united at the end of the line, arriving within a few minutes of each other.



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The line continued through the Thickwood hills in ranges 15 and 16, passing through some good spruce, though here, too, the fires have done considerable damage. This timber could probably be handled either from the Athabaska or McKay rivers. The soil on these hills is excellent.

In range 17 the line dropped from the hills rather abruptly into a country principally muskeg which extends westward to range 20, rising slightly to the west. This country is drained on the north by McKay river and on the south by the Little Buffalo, both of which flow in an easterly direction into Athabaska river. The swampy surface is for the most part shallow as is evidenced by a heavy growth of large tamarack which covers most of this country. Several of the small feeders of McKay river cross the base line in range 19.

In range 20 ridges of jackpine occur and on the westerly side of the range a fairly large lake was crossed, the shores of which are heavily timbered with spruce, poplar, birch and jackpine. Several other lakes occur in the vicinity of the base line, in ranges 21 and 22. There is no well-defined ridge marking the height of land here although to the south it becomes quite pronounced. The levels and drainage indicate the centre of range 22 as being the summit of the height of land. Areas of good agricultural lands occur in the country adjacent to the height of land, especially in the vicinity of the lakes. The prevailing timber is poplar but much of it has been destroyed by fire.

Proceeding westward from the height of land large areas of muskeg, for the most part burnt over, are encountered. The relative amount of muskeg and poplar lands varies considerably in the Wabiskaw valley, the general impression received being favourable as to the agricultural possibilities of this district.

Wabiskaw river crosses the base line in the centre of range 23, and is about six chains wide. It is navigable from its principal source in Wabiskaw lake through to Peace river for scows drawing two feet of water. Its course is much broken by rapids but it is doubtful if power developed in these would have commercial value. In the vicinity of the base line its banks are from four to ten feet high and it flows through a valley fifty feet deep and half a mile wide.

West of the river, after passing through the poplar ridges immediately adjacent to it, muskeg country was encountered extending across range 24. Beyond this the country becomes hilly and rises sharply to the west. Formerly extensive forests flourished on these hills which continued to the west beyond the fifth meridian, but fires have destroyed much of them although some considerable patches of merchantable timber still remain.

The base line was completed to the fifth meridian on February 28, 1912, and after the completion of the necessary work for closing, the party set out for Athabaska Landing, arriving there on March 17.



## APPENDIX No. 16.

## ABSTRACT OF THE REPORT OF L. BRENOT, D.L.S.,

## SURVEY OF PART OF THE WESTERN BOUNDARY OF THE PEACE RIVER BLOCK.

Having completed the organization of my party, I left Edmonton on March 3, 1911, and proceeded via Athabaska Landing and Grouard to Peace River Crossing where I arrived on the 20th. From there I proceeded to Dunvegan on the ice and thence to Spirit River settlement. There I left my sleighs and proceeded westerly towards Pouce Coupé prairie by pack-trail, there being no sleigh road.

It would not be a difficult matter to convert this pack-trail into a sleigh trail, as not more than one-fifth the distance is heavily timbered, the remaining four-fifths having been burnt over so often that it is almost bare prairie.

From Pouce Coupé prairie I followed an old Indian pack-trail that leads north-westerly from Pouce Coupé to Peace river, and on April 15 arrived at the camp of Mr. Geo. McMillan, D.L.S., in range 15, on the twenty-first base, which he was then engaged in surveying. I with my party assisted Mr. McMillan to produce this base to the westerly boundary of the Peace River block which was reached on August 11, and the following day I began the survey of the western boundary of the block northerly from the base line.

I had completed the survey of this line to the north boundary of section 25, township 86, on September 28, when Mr. J. R. Akins, D.L.S., who had completed the survey of the north boundary of the block, came to my assistance with his party. The two parties working together made good progress and on October 12 the north-west corner of the block was reached.

At the intersection of the western and northern boundaries I erected a monument and besides the large iron post I placed a spruce post marked 'N.W. cor. P.R.B.'

Two days later I started homewards, reaching Spirit River settlement on November 10, and Edson on December 6. I paid off the party at Edmonton on the 11th and reached Ottawa on the 18th.

DESCRIPTION OF THE COUNTRY ALONG THE WESTERN BOUNDARY OF THE PEACE RIVER BLOCK  
NORTH OF THE 21ST BASE LINE.

The first mile and a half north of the base line is sloping down towards Peace river, which the boundary intersects at about half a mile below what is known as the Peace river canyon. On the south side of the river there is no flat, the hill ending abruptly at the edge of a cut bank about 120 feet above the water level. This cut bank greatly facilitated the triangulation of the river, as there are inaccessible wooded islands on the line and the south bank is covered with a heavy growth of small poplar. Down the river and situated approximately in the south-east quarter of section 13, township 81, range 26, lies Hudson Hope, which comprises only the fur-trading posts of Revillon Bros. and the Hudson's Bay Co. On the north side of the river is a small flat, which is heavily timbered with spruce, and from the top of the bank which is about 800 feet above the level of the river, to a little beyond the centre of township 81, there is a heavy growth of small poplar. The soil to this point is chiefly light sandy loam and not very good for agricultural purposes, while the country northwards to the northwest corner of township 81 is timbered with small spruce and jack-pine. As the surface is covered with moss there is no vegetation. In section 23, township 81, the line crosses a pack-trail known as the 'Rocky mountain portage,' connecting Hudson Hope with Cust's House at the head of Peace river canyon.



Township 82 is fairly open, scattered second-growth poplar of about two inches and willow scrub being the only bush. It is perfectly level except sections 11 and 26 which are crossed by deep ravines through which flow Lynx creek and its north branch; both these creeks furnish an abundant supply of good clear water throughout the summer. The soil like that in the preceding township is not very suitable for agricultural purposes, and there is very little vegetation except at the bottom of the two ravines mentioned above.

The southern part of township 83 is rolling country and is timbered with poplar from three to eighteen inches in diameter, alder and willow scrub, but the northern half is covered with many hay meadows from which hundreds of tons of wild hay could easily be cut. The soil is of a much better class than that in the two preceding townships, being generally from three to twelve inches of humus overlying a subsoil of clay loam and in some places sandy loam. There is a good pack-trail leading from this township to the mouth of Halfway river.

A small river known to the Indians as the Red river and having an average width of one chain flows in a southeasterly direction through township 84 to Peace river. In its valley are numerous patches of open prairie, some being over a hundred acres in area. These prairie spots are covered with a luxuriant growth of pea-vine, the soil being extremely fertile. This would be an ideal place for ranching. Both banks of the river, which are over 200 feet high, afford good shelter for stock and the river furnishes an abundant supply of water. Brook-trout and grayling abound in this stream.

In the centre of township 85 we came across Ground Birch creek, which is from thirty to sixty links wide and two to three feet deep at low water. Being a mountain stream it rises very quickly and to a great height, the high water mark being about ten feet above its normal level. A fine prairie extends for about one and a half miles on either side of the creek. The soil of this tract is very good being chiefly humus three to six inches in depth overlying a sandy loam subsoil. The northern part of the township is timbered with heavy spruce and poplar from six to eighteen inches in diameter.

All of township 86 except section 35, in which Halfway river is crossed, is too broken to be suitable for settlement. It is timbered chiefly with jackpine and spruce from four to fourteen inches in diameter, with a thick undergrowth of willow scrub.

Halfway river at low water has an average width of three chains, a depth of four feet and a current of three miles per hour. Its source is in the Rockies and, like all mountain streams, it rises very quickly. At high water the average width is about ten chains.

On the north side of the river the country rises by benches up to the centre of township 87, range 25, there being an extensive flat after each rise. These flats are mostly prairie with a few scattered bluffs of poplar and some spruce. The soil is very fertile; in fact it is the best that was seen on this line, being composed chiefly of clay or sandy loam to a depth of eighteen inches.

In the southern part of township 87, the boundary intersects the R. N. W. M. P. pack-trail from Fort St. John to Fort Graham.

#### THE TRAIL FROM THE WEST BOUNDARY OF THE BLOCK TO FORT ST. JOHN.

This trail follows along the north side of Halfway river in an easterly direction for about twenty miles, then in a southeasterly direction to Cache creek, down the east side of the latter to its mouth at Peace river, and thence on the north side of Peace river to Fort St. John. Most of the country through which it passes is rolling open prairie. The soil varies, being very fertile in the valleys of the Halfway and Peace rivers, but poor and unsuitable for settlement elsewhere. As plenty of hay and water could be obtained, mixed farming should be a success in the valleys.



## SESSIONAL PAPER No. 25b

In the northern part of section 19, township 87, range 25, the country begins to fall gently to the north branch of Halfway river. The timber is chiefly jackpine and spruce, but there is also a great amount of deadfall. The north branch of Halfway river is a small stream about two chains in width and two to three feet in depth, with a current of about two to three miles per hour. It flows in a southeasterly direction and empties into Halfway river about fifteen miles from the intersection of the latter stream with the boundary. The country to the north of this branch rises gradually to a height of about 700 feet above the river. In the first three miles the land greatly resembles that north of the Halfway, but in the last two miles it slopes gently to the north and is timbered with heavy spruce and poplar from six to twenty-four inches.

During the summer months the heat is generally tempered by cool breezes blowing from the Rocky mountains, which lie about ten miles west and almost parallel to the western boundary of the block. There was no frost that would injure grain before September 18.

The game of this region comprises moose, bears, partridges, prairie-chickens and almost all species of fur-bearing animals, but ducks and geese are scarce.



## APPENDIX No. 17.

## REPORT OF M. P. BRIDGLAND, D.L.S.

## TRIANGULATION SURVEY IN THE RAILWAY BELT OF BRITISH COLUMBIA.

CALGARY, March 4, 1912.

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa.

SIR,—I have the honour to submit the following report of my field operations on the triangulation in British Columbia, in connection with the Trigonometrical Section of the Topographical Survey of Canada, for the season of 1911.

The work was commenced May 8, and in accordance with your instructions dated April 24, 1911, directing that the eastern part of the triangulation be retraced, an attempt was made to find station I, on the fifth meridian, and station II, on Nose hill.

At the latter station the old wooden hub was found. Station I was re-established as nearly as possible in its original position on the fifth meridian, 17.25 chains south of the northeast corner of section 13, township 24, range 1. Of the next four stations established by Mr. Drewry in 1890, old hubs were found at station V (Sarcee Butte), and station VI (Cochrane). At stations III and IV (Brushy Ridge and Spy Hill) no trace remained of the original stations, and these were accordingly re-established on the highest points of the ridges. Angles were read at all these points giving a new set of angles for four triangles at the eastern extremity of the system. Also stations III, IV and VI were connected with the nearest monuments of the Dominion Lands system. Each of the above stations was marked by a brass bolt embedded in cement, the top of the bolt being about two feet below the surface of the ground, and flush with the surface of the cement. The bolt in each case was stamped with a triangle and with the number of the station in Roman numerals. The apex of the triangle faces north, is at the centre of the head of the bolt, and is the geodetic point. For reference points three-foot iron posts were used and at least one placed at every station except station V. These posts were driven down to within about five inches of the top and were stamped with 'T.S.' and the number of the station on one side, and 'W.P.' followed by the distance in feet and the bearing to the station on the opposite side. At station V (Sarcee Butte) which was on a rocky ridge, two iron reference bolts were cemented into solid rock and their bearings and distances from the station measured.

An effort was also made to locate Mr. Drewry's base near Cochrane which he had established in 1890 and marked by iron bars. The post at the east end was found, but the post at the west end had evidently been removed.

As is usually the case in this class of work, considerable time was lost through unfavourable weather. Also much delay was caused by excessive refraction. It was found impossible to sight on signals with any certainty between 8 A.M. and 5 P.M., except on cloudy days.

On June 5, a start was made for Revelstoke, two of the party having been sent ahead to get the horses and outfit stored at Golden. A stop of one day was made at Morley to locate station VII (Chiniki) and connect it with the Dominion Lands system. The station was found and tied in to the post at the intersection of the north boundary of township 24, range 7, west of the fifth meridian, and the south boundary of the Stony Indian reserve. This station was not permanently marked.



## SESSIONAL PAPER No. 25b

By June 8 the party was camped at Revelstoke and ready to commence work on the western part of the triangulation. Owing to a very heavy snowfall and a later spring, work on the higher peaks was found to be impossible and a short exploratory trip was made to Salmon Arm to select points to help in the expansion of the base. The western part of Bastion mountain was visited but was found unsuitable. Permanent signals were erected on Granite mountain and on Fly hill about five miles southwest.

In the meantime two of the party had twice attempted to erect a signal on Queest mountain above Shuswap lake, but owing to the great depth of snow, they were unable to do so. Later on, about June 28, this was done. The ascent was made from Craigellachie, crossing Gorge creek some distance north of the railroad. There is much fine timber in this district. The ascent by this route, and also the descent, was found to be very tiresome and tedious. Later on the mountain was ascended from Malakawa, the ascent being made easily in about six hours.

An attempt was made to locate the sixth meridian, a short distance east of Revelstoke. Owing to fire and lumbering operations the monuments here have been destroyed and the nearest existing post is the northeast corner of section 34, township 23, two miles farther west. Owing to the canyon-like nature of the Illecillewaet valley it was found impossible to make a direct tie to Mount Albert, and later on a secondary station was established on Mount Mackenzie. This station served to connect Mount Albert with the above-mentioned section corner, and also helped to connect Mount Begbie and Mount Copeland with the northeast corner of section 33, township 23, range 2, west of the sixth meridian.

Throughout all of June and the early part of July, it was cloudy most of the time and considerable rain fell, so that it was very difficult to get any work done. Accordingly, having instructions to make connections between Cascade mountain (station XII) and Storm mountain (station XIV) Mount Bonney (station XXV) and the posts of the Dominion Lands system, it was decided to move to Banff, and on June 11 camp was pitched near the town.

A suitable base was found which could be connected by a short traverse to the middle of the north boundary of section 1, township 26, range 12, west of the fifth meridian. The ascent of Cascade mountain, from the west side offers no difficulty. An old wagon road leads up Fortymile creek to the water-works dam. From there the route leads northerly along the side of the mountain gradually ascending until a deep canyon is reached, whence a steep slope leads directly to the ridge from which the main peak is easily accessible. The slopes throughout are easy, there being no standing timber and very little windfall. The station lies on the highest southerly point of the mountain. The old cairn had fallen over but the base was still intact. It was rebuilt to a height of 6-7 feet.

On July 17, the party moved to Castle mountain. A good base about 143 chains long was obtained about two miles west of the station and by means of this, Storm mountain was connected with the survey posts in the valley. An azimuth observation was taken at the west end of the base. The route followed from the railroad to Storm mountain was practically the same as that described by Mr. Carson in his report of 1906, contained in the annual report of the Topographical Surveys Branch for the year 1906-1907.

Our next move was to Glacier where a base sixty chains in length was selected just east of the Ross Peak water-tank. By means of two secondary stations, one on the side of Mount Cheops and the other on Mount Abbott, this base was connected to Mount Bonney.

The ascent of Mount Bonney was made by what seems to be a new and very much easier route than those previously followed. A light camp was taken to the head of a small valley which joins Illecillewaet river about a mile west of Ross Peak station. From there a steep but easy climb leads to the snow field at the back of Mount Bonney. Crossing this snow field, the ridge above the basin of Loop creek



was reached and from there the arête runs directly to the summit. Under favourable circumstances it should not be a difficult matter to make the ascent from Glacier in a day and a half, if the first afternoon were devoted to taking camp to the head of the valley, and the day following to the ascent of the mountain and the return trip.

On the evening of August 4, we returned to Revelstoke. At first the smoke was very dense owing to forest fires close by, but heavy rains soon remedied this. As soon as the weather permitted, camp was taken part way up Mount Mackenzie, and on August 9, the peak was ascended and the return trip made to the railroad the same day. The route followed was the same as that taken in 1910. The station was, marked by the usual brass bolt stamped with a triangle and the number of the station 'XXXIVA.' The apex of the triangle faces north and is at the centre of the head of the bolt. Two iron reference bolts were also placed, one six feet south and the other six feet north from the station. A cairn five feet in diameter at the base and seven feet high was built above the station.

The next station visited was Albert (XXVII) following the route described by Mr. Carson in his report for the season of 1909, contained in the annual report of the Topographical Surveys Branch for the year 1909-10. Owing to difficulties connected with the location of station XXXII near Camborne, we could not complete the work at this point and had to return again later in the season.

On returning to Revelstoke, it was decided to visit Mount Griffin (XXXIX) leaving two of the party to ship the horses and outfit to Camborne, thus saving all the time usually lost in shipping and moving camp. Accordingly a light camp was taken to timber-line on Mount Griffin just below the signal following the same route as in 1910. Two days were spent there reading angles and taking azimuth observations. The station is marked by a brass bolt stamped with a triangle and the number of the station, 'XXXIX.' Two iron reference bolts were also placed, one 13.5 feet south and the other 18 feet north of the station. All bolts were cemented in solid rock. Above the station a cairn five feet in diameter at the base and 9.3 feet high was built.

On August 10, main camp was reached above Camborne. As soon as possible, camp was taken to timber-line below Mount Burniere following the trail to the Burniere mine. This trail had been recently cleared out and was in much better condition than in the previous year. On ascending Mount Burniere, the following day, it was found necessary to establish a station on a peak about 500 feet higher and about two miles farther west. This peak proved to be very suitable for a station and angles were read and an azimuth observation taken. This station was called Incomappleux.

The peak consists of a long narrow ridge with precipitous rock faces on the south side and glaciers on the north. The station is near the eastern end of the ridge, and is marked by a brass bolt stamped with a triangle and the number of the station, 'XXXII.' Four reference bolts, marked, were placed as follows: the first four feet north, the second and third each distant five feet from the centre and bearing south  $65^{\circ}$  east and south  $20^{\circ}$  west respectively, and the fourth four feet distant and bearing south  $55^{\circ}$  west. All bolts were cemented in solid rock. Over the station a cairn four feet in diameter at the base and 6.5 feet high was built.

At Mount Burniere, a secondary station was established. This station overlooks the Incomappleux valley and should be very useful for making any necessary connection with the monuments of the Dominion Lands system in the valley. The station was marked by the usual brass bolt stamped with a triangle and the number of the station, 'XXXIIA.' Four reference bolts were placed as follows: one north 5.5 feet, the second north  $84^{\circ}$  east and 6.3 feet distant, the third bearing south  $34^{\circ} 30'$  east and distant 7.9 feet, and the fourth bearing north  $82^{\circ}$  west and 12.6 feet distant from the centre. A cairn five feet in diameter at the base and 8.4 feet high was built.



## SESSIONAL PAPER No. 25b

On August 29 we returned to Revelstoke, but were again delayed by rain. As soon as the weather permitted, we again ascended Mount Albert and completed the work there. An azimuth observation was also taken at this point.

On September 5 a start was made for Mount Copeland, near the head of Jordan river. The Jordan trail had been partially repaired during the summer, but it was still in poor condition. On the first day camp was taken as far as possible by horses and on the second a light camp was taken to an amphitheatre below the peak. Two days were lost through bad weather, but the third day was beautifully clear. The station is marked by a brass bolt stamped with a triangle and the number of the station, 'XXXVII.' Three reference bolts were placed as follows: one bearing south  $82^{\circ}$  east and distant 4.7 feet, the second bearing south  $5^{\circ}$  west and distant 7.1 feet, and the third bearing north  $36^{\circ} 30'$  west and distant 7.0 feet from the station. A cairn five feet in diameter at the base and seven feet high was built.

On September 10 we again reached Revelstoke, and next day started for Mount Begbie, hoping that we might have a few days of continuous fine weather. This hope was vain. We camped at an elevation of about 6,500 feet on the side of Mount Begbie the second day. The weather had been fine but about four o'clock heavy black clouds rolled over the summit and it was not until September 25 that we were able to make the ascent. Then the mountain was covered with about eighteen inches of fresh snow and the weather was cold, making instrument work on top very difficult and disagreeable. This station is on the highest eastern point of the mountain. It is marked by a brass bolt stamped with a triangle and 'XXXVIII.' Three reference iron bolts were placed, each six feet from the station and bearing east, south and west, respectively, from it.

The party next moved to Enderby and camped on Shuswap river, a short distance below the village. While preparations were being made to visit Mount Mara and Mabel mountain, a station was established on a low bare knoll near the northeast corner of section 22, township 19, range 9, west of the sixth meridian. The station is marked by a brass bolt stamped with a triangle and the letter 'E.' Three iron reference bolts were placed, one bearing south  $42^{\circ} 25'$  east and distant 12.3 feet, the second bearing south  $53^{\circ}$  west and distant 12.2 feet, and the third bearing north  $56^{\circ} 20'$  west and distant 4.7 feet from the centre. All bolts are cemented in solid rock.

On October 2 we started for Mount Mara near the summit of the Hunters range. The route followed was exactly the same as that taken the previous year. The signal was marked by a brass bolt stamped with a triangle and the number of the station, 'XLII.' Four iron reference bolts were placed bearing north, east, south and west from the signal, the first three being six feet and the fourth nine feet distant from it. All bolts were cemented in solid rock.

The next trip was to Mabel mountain. This was reached by crossing Mabel lake and following the Indian trail up the mountain. The trail has not been used recently and is fast becoming obliterated. The station itself lies in the western part of the summit, overlooking Mabel lake. It is marked by the usual brass bolt stamped with a triangle and the number of the station, 'XLI.' Four iron reference bolts were placed as follows: the first north  $4^{\circ} 30'$  east and distant 4.4 feet, the second north  $71^{\circ} 00'$  east and distant 11.3 feet, the third south  $32^{\circ} 30'$  west and distant 11.2 feet, and the fourth north  $66^{\circ} 40'$  west and distant 10.5 feet from the signal. All bolts were cemented in solid rock. On the west bank of Kingfisher creek, starting at the northeast corner of section 15, township 19, range 6, a line about 120 chains long was run in a north-westerly direction. This line was carefully measured and affords a direct tie to the iron post at the above section corner.

Our next move was to Salmon Arm. From here a light camp was taken up to Malakawa in order to ascend Queest mountain. On October 20 we started and reached the summit about two o'clock. Owing to clouds and slight snow flurries, we could do nothing that evening and spent the night shivering around a camp-fire. Fortun-



3 GEORGE V., A. 1913

ately the next morning was clear and we completed our work and returned to Malakawa in time to catch the evening train to Salmon Arm. At Queest mountain (station 'XLIII') no permanent marks were left. The station is on the southwest point of the mountain and is marked by a cairn four feet in diameter at the base and 6.5 feet high.

On returning to Salmon Arm a few days were spent ranging out the base and taking magnetic observations where possible. The horses were sent down to Vernon, arrangements having been made to winter them there, and on October 28 the outfit was shipped to Calgary.

On November 1, finding it possible to do so, I took an azimuth observation at station I, on the fifth meridian, using as a reference object a signal at station II, on Nose hill.

From October 3 to 23 I was engaged in making a survey of some villa lots at Banff, and a correction survey near Airdrie, in township 27, range 1, west of the fifth meridian. Owing to snow and intensely cold weather it was found impossible to make satisfactory progress and consequently when the latter survey was completed, I closed work for the season.

I have the honour to be, Sir,

Your obedient servant,

M. P. BRIDGLAND, D.L.S.



## APPENDIX No. 18.

## ABSTRACT OF THE REPORT OF A. V. CHASE, D. L. S.

EXAMINATION OF LAND AND MISCELLANEOUS SURVEYS IN THE KAMLOOPS DISTRICT OF THE  
RAILWAY BELT.

The examination of that portion of the Tranquille forest reserve not done by R. D. McCaw, D. L. S., in 1910, was our first work of the season. This portion of the reserve is very rough and rolling. There is no merchantable timber and except for a few stretches of grazing land it might be considered useless were it not for the fact that the thick growth of small scrub timber, which proves more or less of a snow shelter, prevents too rapid evaporation of the moisture collected there during the winter, and thus acts as a sort of reservoir to regulate the stream flow. It is all over 4,000 feet above sea-level and its highest point is 6,000 feet.

The valley of Tranquille river in townships 22 and 23, range 20, west of the sixth meridian was next examined. The surface in the latter township is composed of steeply sloping land and gulches, very rough and useless for agricultural purposes. Some merchantable fir is found in the southwest part of the township, but the grazing has been destroyed by the frequent forest fires, except in a few flats and sloughs.

The land in the valley of Criss creek in township 23, range 21, is all steep and precipitous, and unfit for cultivation of any kind, but some land suitable for growing hay and the hardier vegetables lies along this creek in township 24, range 20. The possibility of growing cereals there is doubtful as frost occurred very frequently in July.

On the hills east and west of Criss creek there is considerable fir and bull pine of medium size, chiefly in the western part of township 23, but to the north in township 24 and in the higher altitudes this is replaced by smaller timber and scrub with jackpine. Some good grazing land is found in the northwest part of township 23, range 21.

Our next work was the examination of lands along Deadman river and its tributaries north of the sixth correction line. This river flows southwesterly through a valley bounded by steep precipitous hills, showing outcrops of solid rock on the west side and steeply rolling land on the east side. Almost all the good workable bottom-land in this valley is disposed of. Some fir of medium size grows on the slope east of Deadman river, and jackpine grows farther north. There is very little grazing land in this valley.

Rising rapidly from Deadman river toward the west the land reaches an altitude of 4,000 feet above sea-level in about two miles, while the centre of township 23, range 23, is about 5,700 feet. Although large areas of jackpine occur, there is no timber of merchantable value, but some meadows were found in township 23, range 23, and timber grass grows throughout the whole area.

On July 26 I moved camp to Pass valley and commenced the examination of lands in ranges 23 and 24, south of the sixth correction line, and north of Thompson river. Range 23 of this locality is very rough, particularly in the valley of Eightmile creek north of Pass valley. No agricultural land that could be profitably irrigated was found although attempts have evidently been made to bring water from Cache creek into this range, a ditch having been found running from Cache creek, through a small area of workable land in the northwest corner of township 21, and emptying into Tsotin lake which in turn is a reservoir for Eightmile creek. Land in this area



risers rapidly to the north from Pass valley reaching a height of 4,000 feet above sea-level at a distance of from one and one-half to two miles therefrom. To the west of Eightmile creek valley, the land rises to Cache creek hills and towards the east to over 4,000 feet above sea-level in the northeast part of township 21, range 23. The timber of value found in township 22, range 23, consists of an area of fir of medium size in the neighbourhood of Pass valley in the southeast portion of the township. Some grazing land is found in the southern part consisting principally of timber grass of fair quality. Except for the above-mentioned area, all the land is timbered, jackpine and scrub predominating.

Township 21, range 23, is more open, the only timber of note being found on about three square miles of the heights of Cache creek hills to the west of Eightmile creek, and from four to five square miles in the northeasterly part of the township. It consists mostly of fir and bull pine of medium size with jackpine predominating in the higher altitude in the northeast part. The open land in the immediate vicinity of Eightmile creek is rough and rolling and fit only for grazing, as is nearly all of the undisposed-of part of the south half of this township, north of Thompson river. Owing to its low altitude and extreme heat, most of this land has been burned almost bare of grass of any kind.

Moving camp to a point on Cache creek near the north boundary of township 21, on July 29, I continued the examination in range 24, in townships 21 and 22. The former is traversed through the centre from east to west by Semlin valley which lying at an elevation averaging 1,700 feet above sea-level, comprises nearly all the lands of agricultural value in this township, except those along Bonaparte river. That part of the undisposed-of lands in this township south of Semlin valley and east of Bonaparte river is composed almost altogether of high, open, rolling land with light slightly alkaline soil, gravelly in places, in such a position as to present no possibilities of profitable irrigation and is useful only as grazing land. To the west of Bonaparte river the land rises very steeply and the undisposed-of parts are of no agricultural value on account of the excessive cost of irrigating such small workable flats from the only available source of water, Bonaparte river. Undisposed-of lands to the north of Semlin valley are composed almost entirely of high rocky hills, fairly well timbered in the northeasterly part of the township with scrub fir and bull pine of medium size, but they are more open near Cache creek and Semlin valley. These hills give fair grazing on the north slopes. In Semlin valley itself there are some small areas of undisposed-of workable land to the north of the lands already taken up, but as there is not sufficient water supply to irrigate the lands already patented, there is small chance of these other small areas being of any agricultural value. An estimate by a competent engineer was made in the interests of the settlers in this valley of the cost of bringing water from Bonaparte river. He found on account of the small amount of fall per mile in the Bonaparte that it would cost in the neighbourhood of \$80,000, a price considered prohibitive, considering the small additional area that would be served.

In township 22, range 24, the land rises steeply to the north reaching an elevation of 4,000 feet above sea-level at a distance of from one and one-half to two and one-half miles north of the south boundary. The land is very rough with the exception of a small area along the south boundary in sections 1 and 2, where probably eighty acres of workable land is found. The only timber of value grows along the south boundary and consists of fir and bull pine of medium size, but these quickly give place to jackpine as one goes north. Grazing is poor on the south slopes.

The lands in Scottie creek valley in township 23, range 25, are in general of a steep, precipitous nature, although a small area of workable sandy loam soil was found along the north side of the creek near the east boundary of the township, at an elevation of about 3,000 feet above sea-level. This area could be irrigated and would probably be fit for cereals as it is fairly well sheltered. The land rises rapidly to the north and south of Scottie creek, and eastward toward the centre of township 23,



## SESSIONAL PAPER No. 25b

range 23. About three square miles of ranges 23 and 24 in this watershed and in the neighbourhood of Hi-Hium creek are below 4,000 feet above sea-level, but the remainder is all high land. The only other lands adjacent to Scottie creek of possible agricultural value are along a small branch of Scottie creek in the northeast part of township 23, range 25. Some areas here are of good flat workable land but adequate irrigation does not appear a profitable possibility. East of the centre of range 24 and north of the sixth correction line the land is all timbered with small growth, mostly of jackpine. Recent fires have burned over most of the east half of township 23, range 24, and a small portion of the southeast part of fractional township 24, range 24, destroying most of the small growth as well as some of the larger jackpine. There is considerable fir of medium size to the south of Scottie creek in range 25, and bull pine with stretches of small jackpine to the north. Some very good grazing land exists in this valley.

The valley of the Bonaparte through townships 22 and 23 presents no workable land which is not disposed of with the exception of a small area adjoining the northern boundary of the railway belt. Possibly an area of fifty acres of the west half of section 29 is workable land. Being at an elevation of 1,800 feet above sea-level this is of agricultural value. These townships are chiefly remarkable for the rough, steep nature of the land adjoining the valleys; much outcrop of solid rock shows to the east of the Bonaparte and steeply rolling land lies to the west. In the lower altitudes the land is rather barren of either timber or grass growth, but as the altitude increases east or west, scrub timber appears, changing to bull pine and fir of medium size at an altitude of about 3,500 feet above sea-level. Timber grass is found in fair quantities where the timber grows thickly.

The valley of Maiden creek holds only very little undisposed-of or irrigable land of agricultural value. This is in section 3, township 23, range 26, and is of such small acreage as to be unworthy of attention. Its altitude, about 3,700 feet above sea-level, is such as to exclude anything but hay growing. The slopes on the south side of Maiden creek present a very fair and uniform growth of fir and scattered bull pine, but on the slopes having a southern exposure the timber is more of a scrubby variety. Grazing is also much better on the shaded north slopes than on the more exposed south slopes.

The valley of Hat creek, through township 22, is very rough in those lands not disposed of, rising steeply to the north and south of the creek bottom to over 5,000 feet in the west part of the township and to 5,000 feet in the Trachyte hills in the east part of township 21, range 26. This area shows no agricultural land of sufficient extent to warrant the expense of irrigation, the small areas of workable land being of such location as to make profitable irrigation, considering the area, very impracticable.

The southeasterly slopes to the northwest of Hat creek are very rough and precipitous, especially in the west part of townships 22, ranges 26 and 27. The land is in general timbered, with open stretches near the creek bottom. On account of the amount of rocky country in this locality, the timber is of rather small size and not of merchantable value. The northerly slopes to the southeast of Hat creek are covered with a better class of timber, although in the immediate vicinity of the creek bottom the land is somewhat open as on the north side. No land of agricultural value was discovered in this locality.

On September 19 I proceeded to Lytton to arrange for the commencement of miscellaneous surveys in that district and on September 25, having completed arrangements and procured the additional men for my party, I moved to Canford to commence subdivision work in township 14, range 23. I surveyed the north boundary and east and west centre line of section 11 and ran a small portion of the east boundary of Lower Nicola Indian reserve No. 10 to determine the bearing thereof and tied the east boundary by traverse to the Dominion system. With the exception of the river-flats of small acreage this locality is rolling, hilly country, timbered with bull pine and fir.



On October 5 I moved to Lytton and proceeded to survey a small portion of the fourth correction line where it crosses Fraser river and a portion of section 35, township 14, range 27, west of Fraser river. I made a traverse of the east bank of Fraser river through sections 26 and 35 of the same township and also of the south bank of Thompson river in township 15, range 26, as far up-stream as could be conveniently done from this camp, and surveyed a portion of the north boundary of section 8.

I next traversed the north side of Thompson river easterly until compelled to abandon this by the blasting operations of the Canadian Northern railway construction. I also surveyed portions of sections 7, 8, 17 and 18 in this township. I found one new settler in section 17, developing a very good bench of about forty acres, but the remainder of the area surveyed is very steeply rolling and of little value except for timber and grazing.

On October 31 I commenced the traverse of Fraser river on the west bank through sections 2, 11, 14 and 27, township 14, range 27, and tied Lytton Indian reserve No. 26 to the Dominion system. I then continued the traverse of Fraser river southerly on the east bank through section 36, township 13, range 27, tying on to what appeared to be the remains of a wooden post, mound and bearing trees on the north boundary of Kanaka Bar Indian reserve No. 2.

Heavy rains and snowstorms becoming prevalent I discontinued work in this locality and with the temperature  $7^{\circ}$  below zero, moved north with a view to continuing the work on Thompson river traverse and tying in all the unfinished work there, reaching Gladwin on November 11. On account of weather conditions, I discontinued the work after tying in the traverses to section 10, township 15, range 26. I moved in to Lytton on November 16 and after shipping my outfit to Kamloops, disbanded the party.



## APPENDIX No. 19.

## ABSTRACT OF THE REPORT OF A. L. CUMMING, D.L.S.

## MISCELLANEOUS RESURVEYS IN SOUTHERN SASKATCHEWAN AND ALBERTA.

The first work of the season, which consisted of the complete retracement of township 7, range 23, west of the third meridian, was commenced on May 28. The northerly two-thirds of this township is a high gently rolling prairie. The southern portion is broken by two large coulees which afford the best shelter for cattle during the winter, and are largely used by ranchers as a winter camp. Pearce's coulee, through which Frenchman river flows, runs in a southeasterly direction and occupies sections 1, 2, 3 and 12. A rancher is located on section 2 and has a large part of it under irrigation. The other coulee runs north from section 2 including parts of sections 11, 14, 15, 22 and 23, and is thickly overgrown with willow and small poplar. Both coulees vary in width from one hundred yards to one mile.

The soil is mostly clay and the township is well suited for mixed farming or ranching. A few outcrops of lignite and bituminous coal were found but no large seams were discovered. Beaver are very plentiful in Pearce's coulee.

Township 7, range 24, which I next resurveyed, is very similar in the character of the soil and general appearance to township 7, range 23. The northerly two-thirds is practically all settled and a great portion of it is under cultivation. The township is well supplied with water as four creeks run through it. Outcrops of coal are found, and a seam is being worked at the north boundary, which supplies the local demand. Although this township is very well adapted for farming it is even better suited for ranching.

My next work was in townships 19 and 20, ranges 7 and 8, west of the fifth meridian. I went by rail from Swift Current to High river and proceeded from the latter place with wagons up the north fork of Sheep river through Black Diamond and Millarville to the northeast corner of section 33, township 20, range 4. From there I used a pack outfit following a rough trail along the north fork of Sheep river through excellent cattle ranching country. After following the river for about ten miles we branched to the north and proceeded by a very circuitous route to the northeast corner of township 20, range 7, arriving there on August 11.

This district is very mountainous, some of the peaks being over ten thousand feet high. The highest limestone ridges are bare and broken, while the slopes are covered with heavy spruce and jackpine with some heavy windfall. The sides of the mountains are deeply gorged in many places which made the work both difficult and dangerous. The locality can be more easily reached by the wagon road which follows the south branch of Sheep river, and at almost any season of the year heavy loads can be hauled over this road which is now opened up to section 9, township 19, range 6.

The south fork of Sheep river flows through the centre of township 19, range 7; its valley varies from a quarter of a mile to two miles in width. The south half of this township contains exceedingly rich coal fields, and it is claimed that the coal is a semi-anthracite containing 75 per cent of carbon.

The mountain slope is heavily timbered with spruce and some tamarack, but considerable damage has been done by fire. Building stone could be quarried. The soil is a clay mixed with gravel except in the valley where it is much richer. Game consisting of caribou, deer, bears, mountain-sheep, foxes, wolves and partridges is found.

Owing to unfavourable weather I closed operations on December 7, and disbanded my party, retaining only one assistant with whom I was engaged on miscellaneous surveys near Edmonton until January 24, 1912.



## APPENDIX No. 20.

## ABSTRACT OF THE REPORT OF H. S. DAY, D.L.S.

## SETTLEMENT SURVEYS IN NORTHERN ALBERTA.

Leaving Edmonton on May 30, 1911, we travelled by trail to Athabaska Landing. From here, having secured a scow, we proceeded by water to Pelican portage, travelling through a country which appeared to be heavily timbered chiefly with spruce and poplar, and making the journey of one hundred and twenty miles in three days and two nights.

I laid out eighteen lots here on the west side of the river. The valley at this place is not very wide and is almost three hundred feet deep. From the top of the hill the country is quite level and is covered with poplar, spruce, balsam and some birch. A short distance back from the edge of the valley are swamps extending all the way to Wabiskaw. These swamps, however, are not over eighteen inches deep and when the timber and moss are removed the land will be good for farming.

The soil throughout the settlement at Pelican portage is first and second class, and the timber, though good in places, is not sufficient to warrant the survey of timber berths. A gas well, bored fifteen years ago, is still burning with a flame of about thirty feet. It is hoped to also find oil here and an oil boring outfit is being placed in readiness to begin operations in the spring. A winter road extends from Pelican portage to Wabiskaw, and is very much used by the trading companies.

The country around Grand Rapids, forty miles from Pelican portage, where my next survey work was, has been burned over, and a scrubby growth of willow, poplar and spruce has grown up among the deadfall. The valley here ranges in depth from three hundred and fifty to five hundred feet. Some of the land is well adapted to farming, but a large amount of it is very wet. The river is from twenty-five to thirty-five chains wide and has cut its way through a ridge of sandstone which extends two miles above and one mile below Grand Rapids island. An enormous amount of power could be developed here as there is a drop of about sixty feet in half a mile.

I laid out twenty-eight lots on the easterly side of the river, and traversed Grand Rapids island, leaving for McMurray, ninety miles distant, on August 18. This distance was covered in less than thirteen hours, and as it is practically all rapids the trip proved very exciting.

About thirty miles above McMurray the tar sands commence, the tar banks in places being one hundred and fifty feet high. The valley on the western side of the river at McMurray is three hundred and fifty feet deep, but there are several river flats with excellent soil in the vicinity. The timber consists of very thick poplar, spruce and birch, the spruce being heavy but too scattered to be of much value. The whole country is underlaid with tar either in sand or limestone formation and it seems probable that this tar deposit will have much to do with the future development of the district. Some of this tar sand was laid on the streets of Edmonton, Calgary and Vancouver last summer and seems to make an excellent paving.

With the large quantity of pulpwood in sight there is an excellent opportunity for the manufacture of tar paper; moreover the sand after removing the tar is, according to a geological report, of excellent quality for manufacturing glass. Some attempts have been made to burn the limestone of this district and the results show a very good quality of lime. There are also large deposits of salt. The soil is good throughout and several settlers have fine gardens in which they raise all kinds of vegetables.



## SESSIONAL PAPER No. 25b

I laid out fourteen lots on the westerly side of the river, and these will probably be homesteaded very soon, but as the twenty-third base line has already been surveyed it did not seem advisable to lay out more lots. I connected my survey with the base line and also with Mr. Selby's survey of 1910.

Work being finished here on September 22, I moved to McKay, thirty-five miles distant, the tar sands and limestone continuing to show all along the river.

At McKay the valley of the river is not more than fifty feet deep. The timber while heavy in places has mostly been burned and replaced by a scrubby growth of spruce and poplar with some jackpine. On the westerly side of the river the country is generally level except where it is broken by the valley of McKay river. There is, however, a great deal of swamp and the soil is generally poor.

The Athabaska Oil and Asphalt company started boring operations for oil last summer. There are indications of coal under the settlement and from a boring made by Mr. Von Hammerstein there is a stream of brine flowing. The odor of sulphuretted hydrogen can be detected at least a quarter of a mile from this well.

After laying out seventeen lots here we left for Chipewyan on October 13 and continued to pass banks of tar sand until thirty miles below McKay. Ten miles below McKay Col. Fenn is at present boring for oil. He bored through eighty feet of tar sand and sixty feet of pure tar which it is claimed contains a large percentage of oil.

Good progress was made until we reached the mouth of Athabaska river where we were detained by head winds for three days and reached Chipewyan only on the 21st having taken nine days to make the one hundred and ninety mile trip.

The north shore of Athabaska lake is practically all rock with a scrubby growth of jackpine, poplar, spruce and willow. There are occasional patches of soil where the Indians have small gardens. The position of the settlement suits the Indians very well as the fur catch is very large each year and Athabaska lake is well supplied with fish, which is a large item in the Indian's diet and on which he feeds his dogs entirely. The southern side of the lake is probably the largest breeding ground for geese and ducks in America. The settlers, most of whom are well to do, shoot large numbers of them, one man managing to secure nine hundred and sixty geese in two weeks.

After laying out forty-two lots, some of which were necessarily very small, at Chipewyan, we left for Edmonton, arriving there on December 12.



## APPENDIX No. 21.

## ABSTRACT OF THE REPORT OF W. J. DEANS, D. L. S.

## MISCELLANEOUS SURVEYS IN THE RAILWAY BELT, BRITISH COLUMBIA.

I left Vancouver on May 16 for my first work of the season which consisted in laying out timber berth No. 544 in section 34, township 2, west of the coast meridian.

This section is situated about one mile south of Port Mann, the new city which the Canadian Northern Railway company is building on Fraser river. The land is consequently very valuable, the adjoining lands being held at from three to four thousand dollars an acre. The surface is undulating and covered with a thick growth of large fir and cedar with heavy underbrush. The soil is either black loam or clay and would produce fruit, vegetables or grain. The Yale and Westminster wagon road which runs through this section was widened during the past season for the convenience of automobiles and now forms part of a through automobile road to the gulf of Mexico.

My next work was the survey of a portion of section 10, township 38, west of the coast meridian, after which I surveyed timber berth No. 553, in township 17, east of the coast meridian. The lands comprising this berth are situated about one mile north of the Canadian Pacific railway and are at a height of from 500 to 800 feet above Fraser river. The surface is hilly and covered with fir, hemlock, cedar and thick underbrush. The soil is good, mostly clay and is well adapted for garden vegetables, small fruits and grain. The settlers in this part are engaged in dairying and raising small fruits and poultry. The principal market is Mission City. From this station the fruit is shipped to points as far east as Winnipeg, one hundred and ten thousand dollars' worth having been shipped during the season of 1910. A jam factory which is located there uses such fruit as will not stand shipping on account of ripeness.

The Northern Power company are developing power from Stave lake and have in course of construction an electric railway which will run close to timber berth No. 553. This will afford cheap and efficient transportation and will enable the settlers to go more extensively into farming pursuits and fruit culture.

Having finished this work on June 26, I performed two small surveys, one in section 2, township 4, range 29, and the other in sections 9 and 10, township 4, range 26, west of the sixth meridian. In the latter survey most of the land occupies the side of a steep mountain and is covered with a growth of alder, birch and poplar, interspersed with some large cedar and fir. The soil is loose rock mixed with clay and is not suitable for agricultural purposes. Strawberries grow in great profusion along the shore of Harrison river and when cultivated attain a great size. The market however is very limited so that extensive cultivation would be useless at the present time. The waters of the river abound with fish.

My next work was to retrace the boundaries of section 19, township 22, east of the coast meridian, near Sumas lake. The settlers around this lake are engaged in cattle raising, dairying and fruit raising. The low land around the lake known as Sumas prairie produces large quantities of hay and is well adapted for the growing of small fruits, while the bench lands situated about twenty or thirty feet above the lake are especially well adapted for the cultivation of cherries, those produced being unexcelled for size, colour and flavour. The B. C. E. railway skirts the shore of the lake making the place easy of access.



## SESSIONAL PAPER No. 25b

On July 17 I moved to Cultus lake to survey sections 18, 19 and 20, in township 25, east of the coast meridian. These sections are very rough and covered with heavy timber, only small patches being suitable for agricultural purposes. After surveying the south boundaries of sections 2 and 3, in township 19, and investigating the divergence between the international boundary and the south boundary of section 5, township 22, east of the coast meridian, I left for township 3, range 29, west of the sixth meridian, where I completed a small survey, and made some small additional surveys in timber berth No. 553, in township 17, east of the coast meridian.

We completed this work on September 26, and moved to township 20, east of the coast meridian to survey lands suitable for farming purposes and to traverse the south shore of Fraser river through the township. Owing to the recent construction of the Canadian Northern railway through this township most of the original monuments along the river have been destroyed. I extended the line from the north side of the river and retraced a number of lines in order to obtain closings within reasonable limits. Three squatters along the flats near the railway are engaged in fishing and raising a few cattle and vegetables.

In township 8, range 26, west of the sixth meridian, I expected to run about fifteen miles, but about two weeks were spent trying to locate reference posts along the railway, most of these having long ago disappeared. I retraced about five miles of the C. P. R. traverse and reestablished reference points on rocks, cutting an arrow with an old drill. I also retraced the boundaries of the Indian reserve to the south of Spuzzum creek and also the boundaries of lot 4.

Owing to unfavourable weather conditions I closed operations on November 20.



## APPENDIX No. 22.

## ABSTRACT OF THE REPORT OF J. A. FLETCHER, D. L. S.

## OBSERVATIONS FOR LATITUDE IN NORTHERN ALBERTA.

I left Ottawa on June 12, 1911, and travelled via Edmonton, Athabaska Landing, Athabaska river and Clearwater river to the fourth meridian in township 89, where my first observation was taken.

Arriving at Athabaska Landing too late to travel by the Hudson's Bay company's boats I was compelled to travel the remaining distance by canoes. Accordingly I hired two experienced rivermen, one for each canoe, and left Athabaska Landing on June 26.

The current in Athabaska river is quite strong and good progress was made down the river by simply drifting. The only place along the river where farming was attempted was at Calling river where mixed farming is carried on successfully. The absence of open land along the river retards settlement in most places. At Grand rapids the outfit was portaged on the tramway to the foot of the island which is about half a mile long. Some companies have proposed developing power at Grand rapids, but the long transmission required, over 170 miles to Edmonton, has prevented the installation of a power plant. Fifty thousand horse-power could be developed easily. Owing to the recent rains the water in the river was quite high and as the swells at the foot of Grand Rapids island were larger than usual some difficulty was experienced loading the canoes. The weight of the outfit added somewhat to the danger of running the rapids at this point, but the trip was made without any damage to the instruments, only a small amount of water being taken in each canoe.

From Grand rapids to McMurray the river runs much faster, but the rapids may all be run with a canoe lightly loaded. At the Crooked rapids and also at Big Cascade rapids, the canoes were let down close to the shore by means of a rope. In this way the large swells due to the high water were avoided. At Mountain rapids the outfit was portaged about three hundred yards along the south bank of the river. From McMurray the remainder of the canoe trip was made up-stream against the current of Clearwater river. We paddled part of the way, but where the water was sufficiently shallow a pole from ten to twelve feet long was used to pole up. An experienced man with a pole in the stern of a loaded canoe can travel as fast as two men paddling. The trip from McMurray to Cascade rapids was made in three days.

From the Cascade rapids to the fourth meridian there are several rapids and some long portages which rendered pack-horses necessary for the remainder of the trip. The canoe men were paid off here and Mr. Blanchet, D. L. S., who was working on the twenty-third base line in this vicinity, furnished me with five horses in charge of his second packer. We followed the pack trail along the north side of the river as far as the meridian. This trail is rather steep in several places, but the footing is good.

There is considerable merchantable spruce along the valley of Clearwater river. This valley is from one to two miles wide and is wooded with poplar, jackpine, spruce and birch. A few open spots occur along the river-valley, the only one of any extent being at the junction of the Pembina and Clearwater rivers, where some good land is seen. Grass grows abundantly for a timbered country and pea-vine is noticed in considerable quantity all along the river.

The fourth meridian was reached on July 15, and as the weather was favourable for observing, in ten days I had observed and computed sufficient pairs of stars to be assured that the resulting latitude was of the accuracy desired.



## SESSIONAL PAPER No. 25b

On clear nights the thermometer dropped regularly to almost freezing-point but did not go below. The sun rose very early in July at this latitude ( $56^{\circ} 42'$ ) and by nine o'clock in the morning the shade was very agreeable. The temperature was much more uniform in cloudy weather, and cold nights were not in evidence. While on the fourth meridian several jackfish were caught in Clearwater river with a trolling line. These fish weighed from five to twelve pounds and were in good condition owing to the water in the river being rather cold. There are some beaver along the river, as evidenced by the poplar trees having been felled and the bark eaten. Muskrats and porcupines as well as ducks and partridges were seen. Bear and moose tracks were also frequently noticed.

We returned to McMurray and travelled up Athabaska river with the Hudson's Bay company's transport which left McMurray on August 9. For transportation of freight between McMurray and Pelican flat-bottomed scows are used, each carrying about five tons and tracked by ten men, the crews doubling at the rapids. The steamer, *Northland Sun*, met the scows at Pelican and the freight was transferred from the scows to the steamer. It took about three and a half days for the steamer to reach Athabaska Landing.

Observations were next taken on the principal meridian at two points, on the north shore of Lake Winnipeg, in township 48, near Big Black river fishing station, and on the south shore in township 35, near Kinnow bay. The station near Big Black river was very conveniently reached, as the Northern Fish company who own this station run the steamer *Wolverine* quite frequently to the northern end of the lake.

A short distance back from the shore swampy country is met and north of township 30 practically no homesteading has taken place on lake Winnipeg. Large quantities of whitefish, pickerel, jackfish, and goldeye are shipped annually from lake Winnipeg. The principal meridian strikes the northern shore about three miles from Big Black river and is easily reached by rowboat. Considerable cloudy and hazy weather was experienced at this station but by September 23 sufficient observations had been taken. We left Big Black river on the 25th and reached Snake island that night. From Snake island we went by sailboat to the principal meridian in township 35, reaching there on the 29th. Rain for a few days delayed observations but the succeeding weather was ideal for observing. The sky was cloudless and the air clear, while the temperature was delightful, the minimum ranging from  $40^{\circ}$  to  $50^{\circ}$  F. each night. By October 9 the observation was completed, and we returned to Snake island in time to catch the steamer *Wolverine* on the return trip to Selkirk.

The last observation was taken in township sixty-two, on the fourth meridian. From Lloydminster we followed the meridian trail to Onion lake. A large part of the wheat in this district suffered from the frost as the large amount of rainfall during the summer caused a greater growth of straw than usual and the ripening of the grain was delayed. Many of the settlers in this district are just starting farming and have no live stock to which the frozen grain could be fed. They are forced to sell their wheat at about thirty-five cents per bushel, and when it is considered that it takes a large quantity of frozen grain to make a bushel, the price realized is small. Those with stock to feed fare much better as the price for live stock is good. It would seem that the settlers in this district who go in for mixed farming and do not rely on the wheat crop alone are much more successful. Several settlers have located north of Saskatchewan river and the land there seems well adapted for grazing, water and natural shelter being available in all localities. From Onion lake the trail was followed by way of Frog lake to Cold lake. The land in the neighbourhood of the lake at this latter place is first class and much of the country is open. During the season of 1911 upwards of one hundred homesteaders are said to have located in this vicinity. Cold lake has a fine gravelly beach and the water is exceptionally clear. This lake has been over-fished in recent years and for the winter, 1911-12, the fishermen have moved to Primrose lake farther north.



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During the first three weeks of November the weather was very cold and for the most part cloudy. Most of the observations on the fourth meridian, in township 62, were taken at temperatures from  $10^{\circ}$  to  $20^{\circ}$  below zero. On November 14 our work being finished we left for home, going first to Lloydminster and thence to Ottawa, where we arrived on December 1.



## APPENDIX No. 23.

## ABSTRACT OF THE REPORT OF L. E. FONTAINE, D. L. S.

## INSPECTION OF CONTRACT SURVEYS IN WESTERN ALBERTA.

I left Edmonton on February 22, 1911, for Entwistle, which I made a base of operations for the examination of survey contracts Nos. 15, 29, 30 and 31 of 1910, and the re-examination of contract No. 22 of 1909.

I next performed some corrections in contract No. 16 of 1909, and opened the necessary section lines to define timber berth No. 1727, in townships 48 and 49, range 6, west of the fifth meridian, which work was finished on August 25.

Leaving for Edson, which I made my base for further work, I proceeded with the inspection of survey contracts Nos. 22, 23, 27 and part of 28 of 1911. I then returned to Gainford, stored part of the outfit and left for Edmonton, arriving there on November 23.

On December 2, after purchasing supplies and securing transport outfit, I returned to Gainford and proceeded with the inspection of survey contracts Nos. 21, 24 and the addition to 22.

This work being finished I returned to Edson on February 10, 1912.



## APPENDIX No. 24.

## ABSTRACT OF THE REPORT OF J. FRANCIS, D. L. S.

## SUBDIVISION SURVEY IN THE WESTERN PART OF CENTRAL ALBERTA.

After organizing my party at Edmonton I left for Bickerdike on April 14, 1911, and from there followed the trail along the valley of the west fork of Embarras river.

On account of the lateness of the season and the scarcity of horse feed we did not reach our starting-point, township 45, range 23, west of the fifth meridian, until May 12. The northeast portion of this township lies between the main ranges of the Rocky mountains and an outer range which I have named the 'McLeod Mountains.' This latter range or spur, branching from the main range near the northwest corner of township 46, range 24, runs in a southeasterly direction to the centre of township 45, range 21, and through range 22 and part of range 21 it forms the divide between the Atlantic and Arctic waters. Between these ranges lies a very hilly country, the slopes being generally wooded, while the intervening valleys have narrow openings, generally more or less muskeg, with creeks of the finest water running through them.

In this part of the country coal seems abundant, as it is here that all leasing and development work has been done. The coal was visible in many places in these hills, principally in the creek beds, and scars and gulches of the hillsides.

The continental divide, which is a bare stony ridge, enters township 45, range 23, on section 25, passes westward and merges into the mountain range on section 20. It continues from there northwesterly one or two miles, rounding the headwaters of the north branch of Brazeau river, then turning south and southeasterly, divides the waters of Rocky river from those of the Little Brazeau.

The southwestern part of this township lies amid the rocky peaks and bald mountains of the first northeastern range of the Rockies.

The south part of the township is drained by the north branch of the Brazeau, while the northern two tiers of sections are drained by the south branch of McLeod river. This latter branch is made up very quickly by numerous creeks seeping from the hillsides and flowing in every direction.

Sections 27, 28, 35 and 36, contain small bodies of spruce and pine timber fit for railroad ties. This grows principally along the slopes facing the south, while those slopes facing the north grow stunted spruce and balsam of no value.

This scanty growth is undoubtedly caused by the ground remaining frozen to some extent during the entire year.

On and near the centre of section 33, along McLeod river, the Mountain Park Coal company are erecting their mining camp buildings and propose to mine coal at an early date.

The spur line of the Grand Trunk Pacific is surveyed as far as this section and is at present under construction. This spur line joins the main branch near the Yellowhead mines in township 49, range 21. A portion of section 36, and of the adjoining section 1, township 46, range 23, which have been surveyed by Mackenzie and Mann as coal claims, were retraced. Some prospecting work has been done and as far as could be seen excellent coal abounds through these sections. The south part of township 46, range 23, which I subdivided, contains the McLeod range of mountains, the middle of this range passing from east to west through the township near its centre. The highest hilltops are bare and rocky, being from 1,500 to 2,000 feet above the valleys. The south slopes are in some places wooded with timber of no great value. Numerous creeks, gulches and ravines cut this range in every direc-



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tion making the township very rough and broken. Branches of McLeod river in ranges 22 and 23, pierce the mountain range and drain the northeastern slope of the next range of the Rockies.

Near the east boundary of the northeast quarter of section 24, township 46, range 24, two branches unite to form the main branch of McLeod river, one coming from a southeasterly direction, the other and larger branch coming from the west, this latter branch continuing west for about six miles where it divides up into a number of creeks. The railroad survey follows the branch which comes from the southeast and continues for about five miles up the stream.

The portion subdivided in township 46, range 24, lies between the McLeod mountains and the mountain range separating the McLeod waters from those of Rocky river. The portion still unsurveyed is bald, rough and mountainous, with no timber and apparently no minerals. Numerous creeks which have their sources in the mountains on the east side of range 25, join together on section 30 and form the west branch of McLeod river which flows easterly through the township. This river is about one chain in width with water from one to one and a half feet in depth, the current, as usual with mountain streams, being very swift with numerous little falls and rapids. Where the river does not pass through rock formation, the bottom is often spread out, the stream often occupying a very small portion of its bed.

The heavy slopes facing the river are timbered with spruce, pine, and balsam, that growing on the north slopes being small, stunted and of no value. The timber growing on the south slopes, more especially through the centres of sections 28, 29 and the east half of 30, is fairly well grown and is large enough for ties or sawlogs. My estimate of this strip is fully one million feet.

Pack-trails following up McLeod river give access to all the three townships in which my work lay, while an alternative one following up the north branch of Brazeau river and crossing the divide in township 45, range 23, reaches the head of the south fork of McLeod river. After next season the railroad will enable prospectors, tourists and visitors to easily reach this part of the country where a delightful month of cool weather can be experienced at any time during the summer. Owing to the rivers in those townships surveyed not being large, little power could be obtained from them during the winter.

Game was not plentiful in this part, a few bears and several flocks of mountain-sheep being all that was seen. Fish of the trout variety were obtained in the north branch of Brazeau river and the west branch of McLeod river. The soil is good only in very small patches, and in no place is it fit for agricultural purposes.

It is well that these townships have been placed in the forest reserve as the summer frosts and short season preclude the growth of any cereal crops; also there is no hay and very small areas of pasture. Mountains of limestone with sandstone and shale make up the rock formation.

Several small patches of timber on favourable slopes will yield sufficient ties to equip the railroad which is being built and to supply pit props for all the mines which may be worked.

On September 22, in eight inches of new snow, we left for Brazeau river, reaching there on the 26th, after cutting pack-trail for one day.

From this date until the end of October the weather was splendid, being the only lengthy spell of good weather we experienced during the whole season. In township 44, range 20, west of the fifth meridian, sections 5, 6, 7, 8, 17, 18, 19 and 20 were surveyed, and the east outline of the township was resurveyed. The western tier of four sections is generally wooded with green timber of medium size, while the rest of the township surveyed was covered with small pine, spruce and brule. These sections are hilly, being made so by Thistle river and its tributaries which flow eastward into the Brazeau. Along the east outline sections 13 and 24 contain some timber of fair size which continues into range 19 and seems to extend far enough to make four or five square miles of very good merchantable timber. The soil in this township is poor,



and the open places, being generally muskeg, afford no pasturage or hay. In township 43, range 20, sections 11, 12, 13 and the south half of 14, are still covered with green timber consisting of pine and spruce, generally small but containing a large number of trees fit for lumber and railroad ties. The north part of the township is covered with brule and second-growth scrub pine, while the greater part of the south half is still green and unburnt, the green timber extending into township 42, range 20.

The northeast corner of the township, on the outline, is near the centre of the northwestern end of the Bighorn range, and is nearly 1,000 feet above Brazeau river. The east boundary of sections 1 and 12 runs along a comparatively level bench and is all in green timber.

The soil in township 43 is similar to that in township 44, the climate not being suitable for agriculture on account of summer frosts and the shortness of the season. Those townships can only be reached by pack-trail, from the north via the Pacific Pass mines, from the south via Banff or Laggan and across Saskatchewan river, or by trail up the Saskatchewan and Brazeau rivers. Brazeau river runs northerly through those two townships; its valley, cut through rock formation, is very narrow and deep, being about five to six chains wide at the top and one to two chains at the bottom, with a depth of from 100 to 150 feet. The river has a swift current and is from two to three feet deep. Dams could be constructed and power obtained in every mile of its course, the water supply in winter, however, being much less than in summer.



## APPENDIX No. 25.

## ABSTRACT OF THE REPORT OF A. H. HAWKINS, D.L.S.

## SURVEY OF THE TWENTY-SECOND BASE LINE WEST OF THE FIFTH MERIDIAN.

On March 22, 1911, our party left Edmonton for Wabiskaw via Athabaska Landing, arriving there April 3. We then moved to Horse lakes where my cache had been placed and storing the sleighs there we used a pack-train for the remainder of the journey. Deep snow detained us for several days, but we finally reached the intersection of the fifth meridian and the twenty-second base on April 25.

The following day we began the production of the base, and on September 22, 1911, having completed it to the east boundary of range 21, we started on our return trip to Edmonton via Peace River Crossing, Grouard and Athabaska Landing.

Throughout the season very wet weather prevailed, rain having fallen upon ninety days, between April 25 and October 1, so that we lost about twenty days, on account of rain, and the constant moisture kept the ground soft, making trail cutting and travelling a very serious matter. During the early part of the season cloudy weather interfered very much with the observations.

The country from the fifth meridian to Peace river and south to the twenty-first base line is all very similar in character, and might very well be described as a gently rolling surface, covered with poplar, spruce, willow and alder, with forty to fifty per cent of swamp, marsh and muskeg and numerous small lakes, most of which are rather marshy along the shores. A number of creeks, usually small, flow to every point of the compass, as the country is the height of land for waters flowing south and east to Wabiskaw and Bear rivers, north to Loon and Lubicon lakes, and west and northwest to Peace river. No hills of any account are to be found in this locality, the so-called Cadotte mountains and Horse hills being not more than one hundred feet above the general level of the surrounding country. Horse hills lie in ranges 2 and 3, and are covered with a very heavy growth of poplar and spruce timber. In fact the best timber seen throughout the whole line is, I think, to be found on these hills. The poplar would measure from three to thirteen inches in diameter and the trees, running from thirty to fifty-five feet in length, are clean and sound. The spruce would measure six to twenty-two inches in diameter, fifty to seventy feet in height, and would without doubt make excellent lumber.

The extent of this area of timber is not great, being about seven to nine miles in an east and west direction and from one to three miles in width, and on account of the scarcity of timber fit for milling in this locality this should be reserved for the settlers.

There is a small amount of timber to be found along the south shore of Lubicon lake, but it is only in patches and does not compare with that on Horse hills, there being a very considerable amount of shaky and punky timber. The same remarks apply also to the timber on Cadotte mountains.

The timber is generally very light and the land could be easily cleared as the stumps of the poplar and balm of Gilead decay very quickly once the tree is cut. There is, I think, quite enough timber for the settlers' use but nothing to warrant commercial lumbering, as wood is the fuel that settlers in this district will probably have to depend upon at least for some time.

At present it is a rather difficult matter to get into this country as the only summer roads are the pack-trails and, in a wet season, these are generally very poor and could scarcely be called roads. A sleigh road leads from Fish camp on Athabaska



river about forty-five miles up-stream from Athabaska Landing which may be travelled on the ice from Calling lake, Rock Island lake, Wabiskaw and Trout lakes, or from Wabiskaw, Wabiskaw river may be followed as far as it may be desired to go towards Peace river.

The twenty-second base line crosses the trail about two and a half miles north-west of Horse lakes, in range 3, section 31. The summer trail into this country passes somewhat farther west keeping close to Trout river, and crossing the line in range 4. This trail passes through some very good land. In fact I think the country in the Trout river valley is well adapted for settlement as large portions of it are comparatively open and support a very excellent growth of grass, vetches and pea-vine.

To reach the country in the vicinity of Lubicon lake about range 13, one could go by Grouard, thence to Whitefish lake trading post by the wagon road, and from this point by a sleigh road to Lubicon lake. It is reported that a good summer pack-trail extends north to Buffalo lake.

While there are many muskegs, and marshes, the country from range 11 to Peace river is said to be good, the soil is excellent and around Lubicon lake are many open patches and places that would require but little effort to make them ready for cropping. Large amounts of hay are put up by the Indians in the vicinity of this lake and a number of Indians have their winter houses about three-quarters of a mile south of the lake and own a herd of fifty or sixty head of rather fine cattle which were in excellent condition.

The country in ranges 19 and 20 is comparatively open having been burned over and is now largely covered with scrub and brush, easily cleared. In many places good tracts of hay, redbtop, pea-vine and marsh grasses grow and the district would make an admirable cattle or horse range. A large tract might very easily be brought under cultivation with a small amount of clearing.

This locality is accessible from Peace River Crossing by a pack-trail which is rather rough and broken as several very deep ravines leading to Peace river have to be crossed in order to reach the open country. In all probability, however, those lands to the west of the river will prove to be more attractive to the settler as they are more easily reached and the country seems to be more open.

A fine tract of country lies between Peace River Crossing and the small prairie extending two or three miles south to the twenty-first base line. Since this line was run, in the spring of 1910, five or six settlers have settled on the small prairie north of the base line. They had very fair crops and comfortable-looking houses and stables.

Game consisting of bears, moose, spruce-hens and willow and ruffed grouse was fairly plentiful throughout the whole of the country crossed by this base line. A few ducks and geese were seen on the larger lakes, and in range 10 a large colony of beaver were noticed.

Muskrats were quite numerous, but mink, foxes and wolves were very scarce. Rabbits appeared to be more numerous than for several years past. Fish were reported as being plentiful in Trout river and whitefish as being abundant in Lubicon and Cadotte lakes.

Hay was plentiful throughout the length of the line and little or no trouble in finding horse feed was experienced after June 1. The best hay meadows were seen in range 10, from four to six miles north of the base line, and in the vicinity of Lubicon lake. Neither minerals of economic value nor coal was found.

Summer frosts will probably prevail in this country until settlement is well advanced and the numerous marshes and swamps drained.

There is probably ten to fifteen per cent more muskeg east of range 10 than was found to the west of this point and the western portion of this locality is probably the best adapted for settlement.

The soil varies from sandy loam to heavy clay loam, and but comparatively little sandy land was seen, the clay loam and humus seeming to prevail.



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The country along the base line is fairly well adapted to mixed farming once communication with markets is established, as the soil is fertile and easily cleared. Cattle and horses thrive during the summer on the native grasses. Wood for building and fuel is everywhere abundant and water is plentiful throughout the entire locality.



## APPENDIX No. 26.

## ABSTRACT OF THE REPORT OF G. H. HERRIOT, D.L.S.

## SUBDIVISION AND TOPOGRAPHICAL SURVEY NEAR PRAIRIE CREEK.

From Prairie Creek we travelled by a freight road to township 49, range 27, west of the fifth meridian. Our work in this township was the completion of the subdivision of the southern portion in so far as it was deemed practicable.

The land in the part subdivided lies mostly in the valley of the Athabaska, and is in part almost level or gently sloping. The most southerly row of sections, however, is broken by Folding mountain and Fiddle Creek range. The valley of Athabaska river to the south is well wooded with spruce and jackpine. The soil is a light sandy clay, and does not produce a very luxuriant growth.

Having completed the work in this township we proceeded with the subdivision of the land lying in the valley of Fiddle creek and its tributary Sulphur creek, extending our lines from the thirteenth base line as far south as the hot springs located in section 8, township 48, range 26. The subdivision thus includes a portion of townships 48, ranges 26 and 27.

The subdivision being completed about August 20, we proceeded with the work of obtaining sufficient data for the construction of a topographical map of the land in the vicinity of the hot springs. The map was to be on such a scale, and to cover such an area, that it would be possible to project thereon a system of roads, and a water-distribution service. The chief road was one from the hot springs to the railway, and the water distribution service to be such that water might be carried to the Grand Trunk Pacific hotel site near the railway and also to the site of a small chalet in close proximity to the springs.

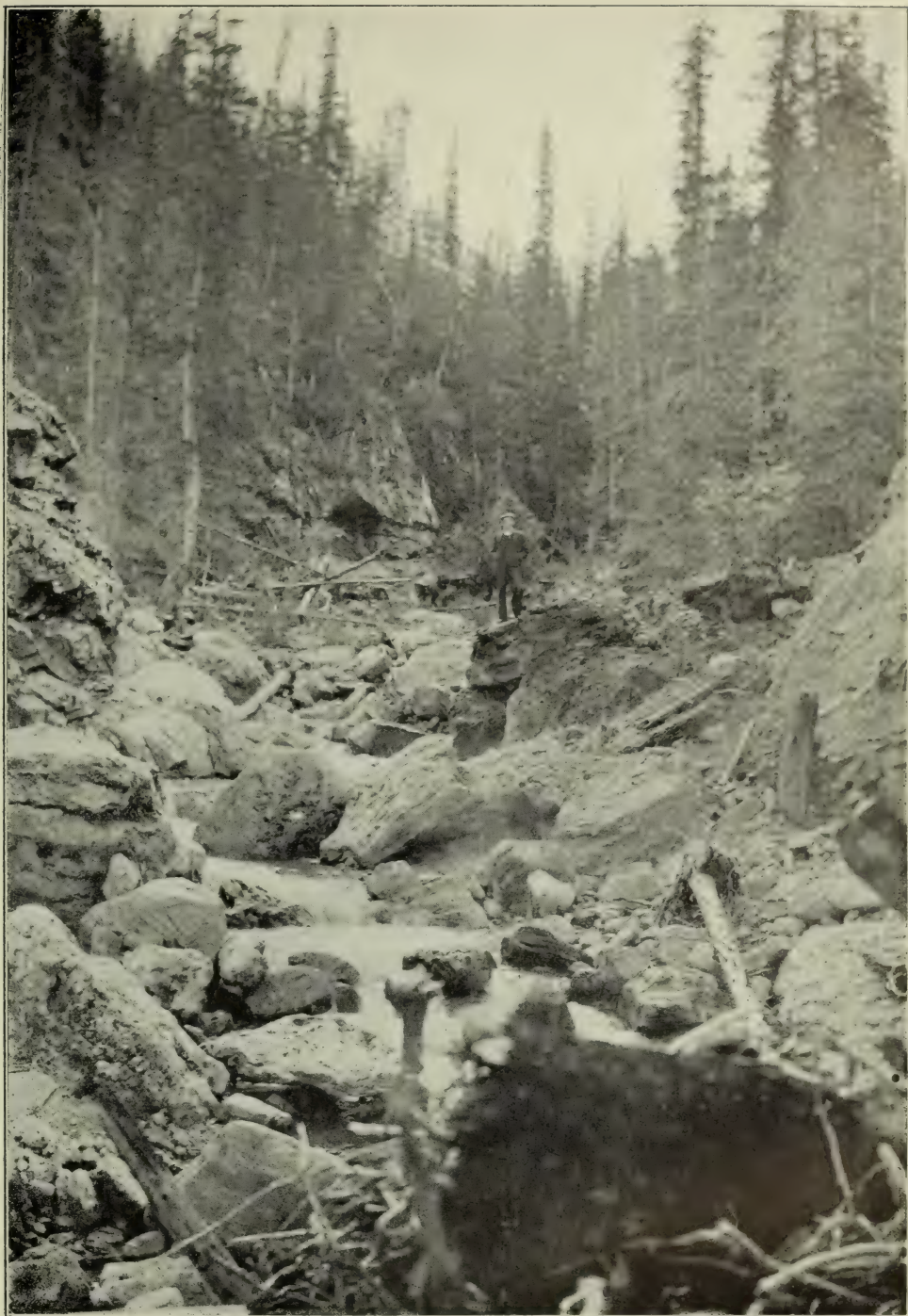
The area covered by the topography might be described as a narrow belt extending along both sides of the valley of Sulphur creek from a little south of the hot springs to its junction with Fiddle creek, and thence as a similar strip along Fiddle creek. Three main traverses were run, one along the bed of Sulphur and Fiddle creeks, and one along each side of the creeks a short distance up the hillside. Occasionally it was necessary to cover some small area by a subsidiary traverse. Levels were carried from a bench-mark on the Grand Trunk Pacific railway near the Jasper Park collieries, along the old pack-trail, to Fiddle creek, and thence up Fiddle and Sulphur creeks to the hot springs.

On October 21 a point was reached about a quarter of a mile north of the north boundary of section 24, township 48, range 27, and as the weather was becoming too cold for sketching and slide-rule work we confined our traverses to one along the new pack-trail, and another along the bed of Fiddle creek to its junction with Athabaska river.

The country covered by our subdivision and topographical survey is rather rough, being cut by several deep V-shaped valleys. It is, moreover, everywhere covered with heavy windfall making travel very difficult. Fortunately in the summer of 1910 a kind of pack-trail was opened from the end of the Jasper Park collieries wood trail up as far as the hot springs. This trail although very rough, passing as it does through several small muskegs, across three of the deep creek valleys and in places along the rough stony beds of Fiddle and Sulphur creeks, was of great value to us.

Also about midsummer under the directions of the Dominion Parks commissioner, a better pack-trail was opened from the wood trail before mentioned to the hot springs. This trail is very good and is moreover very picturesque. It follows along the west





*Photo by G. H. Herriot, D.L.S.*

Sulphur Creek in Jasper Forest Park Reserve, showing Travertin Boulders formed by deposits from Hot Springs.



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side of Fiddle creek from Morris creek to a point near the mouth of Sulphur creek, and from there it follows the west side of Sulphur creek to the hot springs. Perhaps the most beautiful scenery met with, is where the trail meanders along the edge of the bench above the Sulphur creek canyons, which, although not more than one hundred feet deep, are very beautiful.

The greater part of townships 48, ranges 26 and 27, is broken by mountains, the main ones being Fiddle Creek range, Folding mountain and the range of which Roche Miette is a part. Fiddle Creek range is a very prominent limestone ridge which seems to have been thrust up so that the strata appear to be almost standing on edge. Fiddle creek cuts through it in two or three places, forming deep narrow canyons. The grandest of these is situated in section 2, township 49, range 25, and is not more than two miles from the Grand Trunk Pacific railway.

Fiddle creek, the main stream in this area, flows in a northwesterly direction across the townships before mentioned, and empties into Athabaska river at the south end of Brule lake. It is a small stream from twenty to thirty feet in width, with a current of from six to nine miles an hour, and is essentially a mountain stream, in that it follows a winding course along a wide boulder-strewn bed. In periods of heavy rain or rapid melting of the snow on the mountains it becomes greatly swollen carrying with it gravel and boulders. So incessantly has it been carrying debris of every description into the Athabaska, that a large fan-shaped deposit has been formed at its mouth, thus forcing that river close against the rocky bank on the north side, and gradually filling the southern end of Brule lake. In the short distance our subdivision extended, three main tributaries were met with, all occurring on the west side, and in order of occurrence as you travel up-stream are known as Morris, Villeneuve and Sulphur creeks.

From a scenic point of view, Sulphur creek is by far the most important. It enters Fiddle creek in section 19, township 48, range 26, and from there follows a winding course through sections 18, 17 and 8. In section 18 it is joined by a branch stream from the west that is known as the west branch of Sulphur creek. This stream is quite small, being only about fifteen or twenty feet wide. It has a very rapid current, and on one stretch it is very tortuous, winding back and forth in serpentine curves. In this part it has cut a narrow canyon with walls about one hundred feet in height which are almost vertical.

About one and three-quarter miles up the east branch of Sulphur creek at the centre of a broken anticline in which the limestones are standing at a high angle the hot springs are to be found. The hills on either side rise to about one thousand feet above the bed of the creek, and low down in the valley almost on the level of the creek are the hot springs, four large ones and several lesser ones. The many large boulders of travertine found higher up the slope would indicate that at one time the springs issued much higher up the hillside.

The fissuring through which the springs emerge extends for a distance of about 200 feet. The temperature of the main springs ranges from 112 degrees Fahr. in the coolest to 128 degrees Fahr. in the hottest although observations made this summer indicate that the temperature varies slightly with the weather conditions, and especially after a heavy rainfall. The water is charged with gases that give off a smell of sulphur, and the water is quite sulphurous to the taste. From an attempt made to gauge the flow of the several springs, it was estimated that the approximate discharge is about one hundred and fifty gallons per minute. It was a rather difficult matter to gauge the flow as in some places the water breaks through the loose boulders at the edge of the creek bed.

A sample of the water was submitted to the chemist at the Experimental Farm. His report shows that sulphates of lime and magnesia form the larger part of the dissolved solids, and are the materials that are being deposited by the springs.



Following the same line of faulting southeast there are found several large springs, but none that could be called hot springs. They are all depositing large quantities of lime and magnesia and may be found to be of medicinal value.

The sides of the valleys are covered with much standing dead pine and spruce from six to thirty inches in diameter, while the ground itself is covered with a heavy windfall of this dead timber varying from two to eight feet in depth. A second growth of young jackpine has sprung up almost everywhere. In sections 13, 14 and 23, township 48, range 27, however, there is a nice area of live spruce from eight to twenty inches with a few balsam averaging eight inches in diameter. At present, however, this timber is practically inaccessible. The Jasper Park collieries have been using great quantities of the sound dead timber for props in their coal mine.

The soil is mostly of a sandy boulder clay, in some places being covered with a slight depth of vegetable mould. The dead timber would indicate its richness. It is not suitable for agricultural purposes on account of its roughness and the immense amount of clearing necessary, and as a grazing country it is at present impossible, as an animal cannot stray a dozen feet from the pack-trail owing to the windfall. We were occasionally forced to send our horses out to the few suitable grazing areas that occur in that section, as they could not always find feed convenient to our camps.

In section 6, township 49, range 27, is the mouth of the tunnel of the Jasper Park collieries. Several outcrops of coal seams are to be seen on Morris, Villeneuve and Mountain creeks and the company are extending their workings as rapidly as possible.

In this area the climate is that characteristic of the eastern slope of the Rockies. The summer season from May until September is essentially the rainy season, as scarcely a day passes without at least a shower.

It is indeed unfortunate that the half-breeds and Indians made a final slaughter of the game in this section just prior to its being set aside as a natural park. During our sojourn in the park we saw very few wild animals and few signs of their presence. Five or six deer, three black bears and a few partridges were all that were seen. The heavy windfall is of course a great drawback to the country as a game preserve. Athabaska river is but sparsely stocked with pike and rainbow and bull-trout, and the smaller mountain streams are probably too swift and rocky to carry even the mountain trout. The park authorities however exercise a very strict patrol, and it should be a matter of but a few years till game again becomes plentiful.

It is not unlikely that these springs have been known to the Indians for many years, and that they made frequent pilgrimages there with their sick and ailing. Old pack-trails that lead towards the springs can be followed for short distances, and old teepee poles are still to be seen in the neighbourhood. A rude basin has also been shaped so that the water from one of the outlets flows into it.

The area to which this report has especial reference has been set aside as a national park, thus ensuring to the people of Canada, a heritage that may become one of the greatest health and pleasure resorts in the whole land.

The greatest need of this area, if it is to become an important health resort, is a good wagon road from the railway to the hot springs. Two routes are possible. The first of these would leave the railway near the Jasper Park collieries and climbing over the hills to Fiddle creek, would follow the west side of Fiddle and Sulphur creeks to the springs. This would necessitate the crossing of several small muskegs, the deep valleys of two or three tributary creeks and the overcoming of some rather heavy grades. It would moreover, before Fiddle creek is reached, lead through a strip of country devoid of scenery.

The second and better route would lead from the railway along the east side of Fiddle creek as far as the Grand Trunk Pacific hotel site. From there the road would take a long loop to the southeast gradually rising up the east slope of Fiddle Creek range until a suitable altitude is reached, when it would switch back still following the east slope of the ridge in a northwesterly direction, and climbing



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steadily to a point directly above the canyon on Fiddle creek. From this point the road would cut along the edge of the limestone ridge, following along a contour until the canyon is passed, thence gradually descending to the first bench above the creek bed on the east side. This bench would be traversed until Sulphur creek is reached where it would be necessary to cross Fiddle creek on a bridge. From there the east slope of Sulphur creek would be followed to the hot springs. Such a road would be both expensive and difficult to construct. It would also involve some rather difficult engineering problems at the Fiddle creek canyon. As has been previously pointed out, the canyon is formed by Fiddle creek cutting through a limestone ridge in which the strata are standing almost vertical. Immediately to the south of this ridge and on both sides of Fiddle creek is a very soft stratum about one hundred feet in width. The soft stratum has been so eroded as to leave a wide gap between the nose of the ridge and the bench to be reached beyond the canyon. It may be possible to cut a road along the almost vertical face of the limestone to a point where a short bridge could be constructed across the gap before mentioned. Once the bench to the south has been gained it would simply be a matter of following a course that would entail the least cost of construction. Although the first cost of constructing this road would be much higher than that of the other road, it would have a decided advantage in length and in the less cost of maintenance. The up-keep would depend only upon the few loose rocks that might come down, and the occasional falling trees; while the other route would have the disadvantage of muskegs, a longer stretch of trail that would continually be obstructed with falling timber, and possibly two more bridges to keep in repair. Moreover the canyon road would have the decided advantage of having very much finer scenery along its route.

Adjoining the proposed site for the new Grand Trunk Pacific railway company's hotel in this district and immediately to the north of it is a fine gently sloping area that is eminently suited as a townsite. This area is dry, slightly wooded and has a very fine outlook towards Athabaska river and the mountains beyond. Also a few villa lots could be laid out in the immediate neighbourhood of the hot springs, for on the right side of Sulphur creek, about a quarter of a mile from the springs and just above the first slope, a small gently sloping bench is found. Moreover, a small stream rises in the upper part of the bench and could be used as a regular source of water supply. The altitude of the bench is such that water may be piped directly from the hot springs to bath-houses erected there. Furthermore, although the valley of Sulphur creek about the upper springs is quite narrow, right at the lower spring the valley widens sufficiently to allow room for a good sized bath-house.

It is hoped that it may be possible to pipe the water from the hot springs to the Grand Trunk Pacific hotel site and bath-houses to be erected near it. In this connection it may be pointed out that at Banff the water at a temperature of about 102 degrees Fahrenheit is piped a distance of about 4,640 feet with scarcely any appreciable loss in temperature. The pipe is wrought-iron and is protected from the weather by being properly packed about with moss in a wooden box two feet square. The velocity through this pipe would of course be quite rapid as the fall is 460 feet from the inlet to the outlet at the storage reservoir. The loss of temperature would however depend upon several factors, namely, the weather conditions, the protection of the pipe, the diameter and length of the pipe, the velocity of flow, and also on the fraction of the cross-section of the pipe the water occupies. Under the most favourable conditions it is reasonable to expect that the water at a mean temperature of 118 degrees Fahrenheit may be piped from the Sulphur creek springs to the site before mentioned, with no greater loss of temperature than 8 or 10 degrees. The length of pipe would probably require to be about seven miles, and the fall in that distance would be about 1,200 feet or about an average fall of 170 feet per mile. In regard to piping water to the villa site, the length of pipe would not exceed 1,500 feet and the loss of temperature could be made practically negligible.



## APPENDIX No. 27.

## ABSTRACT OF THE REPORT OF E. W. HUBBELL, D.L.S.

## RESURVEYS AND INSPECTION OF CONTRACTS IN SASKATCHEWAN.

We left Prince Albert on May 1, 1911, and arrived at Shellbrook the following day. This is a place of about 350 inhabitants and has a new creamery, a branch of the Bank of Commerce and two elevators, as well as graded roads and sidewalks. The Canadian Northern Railway company is extending its line from here to Battleford. The line is already in operation as far as Blaine Lake, a daily service is inaugurated between Shellbrook and Prince Albert and great quantities of lumber and wood for fuel are conveyed daily from Big River to Prince Albert, a distance of about one hundred miles. This section of the country is well settled and produces lumber, fire-wood, wheat, oats and vegetables.

At Mistawasis, in the Snake Plain Indian reserve, we were delayed for a day by the immense bush fires which raged for several days, destroying great tracts of timber through this section of the country, as well as several houses and stacks of hay.

My first work was the resurvey of township 46, range 5, west of the third meridian, which we commenced on May 9, and finished on June 5.

The surface of this township is undulating, while poplar and willow clumps alternate with open patches of prairie. About 80 per cent is admirably adapted for agricultural purposes. The soil in general is sandy loam and is suitable for the production of wheat, oats, flax and vegetables. All the homestead lands are taken, many being patented, and most of the railway lands are disposed of. A considerable portion of the township is under cultivation, and many of the farms and buildings are very fine. Plenty of wood for fuel is obtainable, but the standing timber is scarcely of merchantable dimensions. The various small lakes furnish a permanent and ample supply of fresh water for stock, and good drinking water is obtained from wells twenty to thirty feet deep. In a large part of the township the sections are fenced, the road allowances are graded and bridges are built where necessary. The surveyed trail from Duck Lake to Green Lake crosses this township and was connected with our survey lines. Skipton post-office, situated in the southwest quarter of section 22, has a semi-weekly mail service from Duck Lake, a place about twenty-six miles distant. The new branch of the Canadian Northern railway from Prince Albert to Battleford passes within a mile of the north boundary of the township.

Marcelin, a small but growing village about six miles west, on the railway, is the nearest place of business. It is the centre of a prosperous agricultural district and at present shows every indication of unusually rapid advancement. This section of the country is admirably adapted for mixed farming, and has all the requisites for the new settler.

From Marcelin we proceeded to Meeting lake, following the old Jackfish trail. The trail is now ploughed up in many places, showing the rapidity with which this section of the country is being settled. New houses are being erected in every direction and the country in general has made a marked advancement during the past year.

We reached townships 48 and 49, range 10, and township 49, range 11, west of the third meridian, of contract No. 6 of 1910, on a fairly good trail from Meeting lake, which goes via Witchehan lake to Green Lake. The soil in these townships is in general black loam, varying in depth from three to ten inches, with clay subsoil; in some places, however, sandy loam with gravel is found. The surface is slightly



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rolling and is thickly covered with poplar four to twelve inches in diameter, willow, a little birch and some scattered clumps of spruce. Both poplar and spruce are suitable for building purposes. There appears to be a scarcity of hay marshes, although willow swamps are numerous, and there is little, if any, open land and no settlers. Altogether this portion of the country in its present condition is not well adapted to settlement. The nearest express office is North Battleford on the Canadian Northern railway about seventy miles distant, and the nearest post-office is Mullingar, distant about fifteen miles.

We finished the inspection of this contract on June 15, and the following day left for Prince Albert, passing, en route, through the Doukhobor villages, crossing Saskatchewan river at Carleton ferry (where the old-time ferry is still in operation), from there to Duck Lake and Macdowall, and thence to Prince Albert, arriving there June 24. Duck Lake is a small town on the Canadian Northern railway. It does not show the usual signs of advancement compared with other towns in this part of Saskatchewan, but on the contrary it seems to be just where it was ten years ago. To a considerable extent this is due to the fact that Rosthern, a small but thriving town on the same railway about eleven miles to the south attracts most of the trade from the surrounding district, it being one of the centres of the greatest wheat growing section of northern Saskatchewan. While passing through the Doukhobor villages, a decided improvement was noticeable in these people, the one time 'Community system' is practically non-existent, and the Doukhobors now appear as prosperous farmers, while their crops, when we saw them about June 20, were excellent, the wheat being then about eighteen inches high. Though they still retain many of their old customs they are gradually becoming Canadianized.

After repairing the outfit and replenishing our supplies we moved via Macdowall to township 45, range 27, west of the second meridian, to resurvey the northern third of this township. This work was commenced June 30 and finished July 15.

The surface of this portion of the township is undulating to rolling, with bluffs of poplar around the numerous lakes and ponds; there is also considerable underbrush. In these bluffs the poplar runs to twelve inches in diameter and is suitable for building purposes. The soil, in general, is black loam averaging about eight inches in depth, with a clay subsoil, and is admirably suited for the growing of grain and vegetables. There is an abundance of good water. Many of the road allowances throughout this township are graded and bridges are built where necessary. In addition to this there are a number of excellent trails which radiate in all directions. All the homesteads in this township are entered for and a fair portion of the land is under cultivation, wheat, oats and vegetables being the principal products. The nearest post-office and village is Macdowall situated on the Canadian Northern railway about seven miles distant.

This district is well adapted for mixed farming. Great quantities of fire-wood are cut in this vicinity and shipped by rail via Macdowall to the various cities and towns in northern Saskatchewan.

My next work was the subdivision of a portion of township 52, range 16, west of the third meridian, distant by trail about 140 miles. In this portion of the country great progress in agriculture is apparent in all directions, houses and fences are being built everywhere, and large areas of land are under cultivation. This progress is more noticeable in the vicinity of Blaine Lake where there are two Doukhobor villages. These Doukhobors no longer live in communities but cultivate the land and act independently of each other. The results are infinitely superior to their original methods and in a few years it will be difficult to find a more thrifty class of settlers. The extension of the Canadian Northern railway from Shellbrook to Battleford passes close to Blaine Lake and when finished will be of incalculable value to this section of the country. There is much vacant land in this vicinity, mostly prairie and, judging from the crops raised by the Doukhobors, it must be of excellent quality, although in places both land and water are alkaline.



We arrived at this township on July 26, and camped in section 1, on the shore of Birch lake, a beautiful and extensive sheet of good, clear water containing several small wooded islands.

We commenced this work July 27, and finished August 3, during which time, we also traversed the west shore of Midnight lake and another large lake situated in the western part of this township. Jackfish, whitefish and sucker are found in both these lakes.

The southern portion of this township is level, some of it is open prairie and scattered hay meadows, and the remainder is covered with poplar ranging from two to ten inches in diameter, and willow, but much of this timber has been fire-killed. The soil is black loam averaging about eight inches in depth with clay subsoil. There are, however, several small patches of sandy country. Plenty of wood is available for fuel, but there is scarcely any fit for building purposes and none of commercial value.

The lakes above mentioned have large hay meadows along their shores from which great quantities of hay are cut annually by the several ranchers in this vicinity. There are a few settlers with first year crops, and the country to the south and east is filling up rapidly. The nearest post-office is Glenbush, about twenty miles south, and North Battleford is the nearest express office, railway station and business centre. There is a weekly mail service between these two places.

On August 4 we left Midnight lake and proceeded by a good trail to Turtle lake to inspect contracts Nos. 15 and 16 of 1911, in the Meadow Lake district. These contracts consisted of townships 58, 59 and 60, ranges 17, 18 and 19, townships 57, ranges 17 and 18, and township 56, range 17.

East of Turtle lake we passed a fairly large lake, around the shores of which are a number of settlers. The country through which we passed is hilly in places and fairly well wooded with poplar and willow. We camped for the night at Turtle lake, where there is a general store having limited supplies. Turtle lake is one of the prettiest and largest lakes in this section of country. It is about twenty-two miles long and in places, five miles wide. The water is very clear, pure and excellent for drinking, while jackfish, whitefish and sucker are plentiful. Great quantities of fish are salted, dried and kept for winter use. There is a fine sandy beach surrounded by some excellent timber suitable for building purposes.

From here we proceeded in a northerly direction past the northeast corner of Brightsand lake, which is another fine body of water, surrounded by timber. The trail we travelled is the one in general use to Meadow Lake in summer, and although roundabout, is preferable to the new trail, which has recently been made from Battleford to Meadow Lake in range 17, when the frost is out of the ground. This new trail when finished will be much shorter than the one now travelled, and a great boon to intending settlers in the north. The Meadow Lake country is one of the finest tracts of unsettled country in Saskatchewan. The surface is, in general, level except in township 56, range 17, and the soil is black loam suitable for the production of wheat, oats and vegetables. The timber, on the whole, is of comparatively small dimensions, although in places it is sufficiently large for manufacturing purposes, especially in the northern townships. There are numerous openings, more especially in townships 59 and 60, range 17, admirably adapted for immediate settlement. Meadow lake, situated in township 59, ranges 16 and 17, is a fairly large sheet of fresh water surrounded by hay marshes. Meadow, Makwa and Rabbit rivers and several large creeks with a few small lakes furnish an ample and excellent supply of fresh water. Hay and fuel are plentiful. Indian Reserve No. 105, about four miles square, adjoins Meadow lake. A large band of Indians live here and a small store is kept by a Mr. Morin, which supplies a limited quantity of provisions. Most of the freight is brought in via Green Lake about forty miles distant, on a fairly good trail, although at high water there is some difficulty in crossing Meadow river. Game and fish are plentiful. In this district large black timber-wolves are seen; they are very savage at certain times of the year and will then unhesitatingly attack a man. There is a post-office



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here with a monthly mail service from Green Lake. This fine country, with its many natural resources, will undoubtedly in a short time be the centre of an extensive settlement. It is an ideal mixed farming district and lacks only railway communication to make it one of the most desirable places for settlement and ranching in Saskatchewan. Upon the completion of our inspection we returned to Glenbush via Mid-night lake by the new road, previously mentioned, in range 17. We experienced considerable difficulty crossing our outfit over some of the floating muskegs, having to corduroy several places, pack our complete outfit across on our backs, and haul our wagons through by hand. Our next work was the inspection of contract No. 13, 1911, comprising townships 50, 51 and 52, range 11, and townships 52, ranges 12 and 13, west of the third meridian, which we commenced on September 6. We reached this contract via the old Buffalo lake trail from Glenbush. The soil in general is black loam with clay subsoil, suitable for the production of wheat, oats, barley and vegetables. The surface is level, with the exception of township 52, range 13, which is slightly rolling and is covered, for the most part, with small poplar and willow, although in township 52, range 13, and the southern half of township 50, range 11, there is some larger poplar and scattered clumps of spruce and jackpine, but not in sufficient quantities for manufacturing purposes. There are numerous open patches and hay sloughs, and the land around Witchekean lake, from which hundreds of tons of hay are obtained annually, is low and marshy. Witchekean lake occupies the greater part of township 51, range 11, and is about five miles across at its widest point. There are several large creeks flowing into and out of this lake which abounds with jackfish and sucker. The water is not good for drinking. Quantities of fire-wood can be readily obtained in these townships. We did not observe any indications of coal, lignite veins or minerals. There are several ranchers around Witchekean lake who own large herds of cattle, this country being admirably adapted for ranching. There are no other settlers, although much of the land is excellent for homesteading. A band of Sioux Indians have established a camping ground on the north end of the lake and have been residing there for a number of years. They are most desirous of obtaining a portion for a reserve and have several shacks and numerous teepees in which they live the whole year. Glenbush is the nearest post office, and has a weekly mail service from Battleford about fifty miles distant, while the nearest railway is the Big River branch of the Canadian Northern railway. There are trails radiating in every direction from Witchekean lake. From here we proceeded via the Green Lake trail, to township 53, range 9, a portion of contract No. 11, of 1911, and inspected nine miles of line, but owing to unfavourable weather conditions we were unable to obtain an astronomical observation. This portion of the country is heavily wooded and hilly.

Our next work was the inspection of contract No. 10, of 1911, comprising townships 53, 54 and 55, range 6, and townships 54 and 55, range 7, west of the third meridian. We entered this contract from the south on a good trail branching from the Green Lake trail, which leads to the Big River sawmills situated on Cowan lake. The surface throughout is level to rolling and is covered with poplar, jackpine, spruce, birch and willow, a small percentage of which is suitable for manufacturing purposes. There are innumerable small lakes and hay sloughs in every direction. Big river averaging about two chains in width and being quite deep in places passes through townships 54 and 55, range 7, and is utilized for the conveyance of sawlogs from various lumber camps to the Big River mills. There is but little open country in this district, and no settlers, although the soil is suitable for the production of cereals. The nearest post-office is Boutin in section 1, township 52, range 8. A branch line of the Canadian Northern railway from Shellbrook to Big River passes through townships 54 and 55, range 7. Once a week a passenger train leaves Prince Albert for Big River, returning the same day. Mixed and freight trains are running continually, but very irregularly. The Big River Lumber company is a gigantic enterprise, controlling most of the timber limits in this district. The capacity of the mills is 75,000,000 feet per annum. When everything is in running order the estimated cut is



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7,000 logs (about 400,000 feet) every twenty-four hours. They employ about 3,000 men in the mills and camps, and 300 teams. Big River village is situated on the south end of Cowan lake, has a population of 800, Catholic and Presbyterian churches, a general store and a school with a daily attendance of 60. The average wages paid for labour is from \$26 to \$40 per month with board and lodging. Cooks are paid from \$75 to \$90. Lumber, firewood and whitefish are shipped in immense quantities to Prince Albert and other points. Having completed the inspection of this contract on October 2, we proceeded to Prince Albert and after replenishing our supplies and having many repairs made to our outfit which had suffered to some extent on our long trip, we got our horses shod and left for contract No. 9, of 1911. This comprises townships 53, ranges 25, 26 and 27, parts of townships 54, ranges 25 and 26, west of the second meridian, and part of township 53, range 1, west of the third meridian. Following the Candle lake trail we crossed Garden river on a good bridge, and leaving this trail in township 52, range 24, reached the southeast corner of township 53, range 25 by one of our own trails where we commenced our inspection. There are no trails in this contract except those cut out by the contractor and the trail to Montreal lake, passing through township 53, range 1, west of the third meridian.

In general, the alluvial soil is black loam, varying in depth from two to six inches with sandy clay subsoil, suitable for the production of cereals and vegetables. The surface is level and low and covered with poplar four to twelve inches in diameter, interspersed with numerous extensive marshes and several large lakes of good water. A fair percentage of the timber is suitable for manufacturing purposes and railway ties, but recent fires have destroyed great quantities of timber in this district. There are but few hay meadows. Spruce river (Little Red river) and Garden river are the principal streams in this contract, the former being used by the lumbermen for conveying sawlogs to Saskatchewan river. Game, comprising moose, elk and jumping deer is very plentiful and we noticed a fresh beaver dam on Garden river. There are no settlers in this portion of the country, which in its present condition is not desirable for immediate settlement. The nearest place of business is Prince Albert about thirty-five miles distant.

From here we proceeded via Shellbrook, passing through a fairly well-settled district, to contract No. 11 of 1911, comprising, in part, townships 51, 52 and 53, range 9, west of the third meridian, where we arrived on November 3. We entered this contract from the east by a trail which connects with the Green Lake trail half a mile north of Boutin post-office and commenced inspection on November 4. The surface of these townships is rolling and hilly and is covered with poplar, birch and willow, of small dimensions, the poplar occasionally reaching a diameter of twelve inches. In the northern townships, however, the timber which is poplar, spruce and jackpine, with small birch and willow, is much larger and there is a quantity of spruce suitable for manufacturing purposes. There are a number of muskegs, a few creeks and an occasional hay slough. Big river meanders through townships 52 and 53, range 9, averaging sixty links wide, two to ten feet deep, with a current from two to four miles an hour. This river runs through a valley about two hundred feet deep, half a mile wide, and in several places wooded to the water's edge.

The soil throughout is a sandy loam with sand or gravel subsoil, and owing to the hilly surface, these townships are not well adapted for agricultural purposes, being better suited for ranching.

In townships 51 and 52, there are no trails other than those cut by the contractor. Boutin, on the Green Lake trail, is the nearest post-office, but Marcelin, between forty and fifty miles distant, is the nearest place of business.

We next inspected contract No. 12 of 1911, comprising townships 49 and 50, range 9, and townships 50, 51 and 52, range 10, west of the third meridian.

We entered this contract on a surveyor's rough trail and commenced the inspection on November 11.



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The surface of these townships is level to rolling and is timbered for the most part with small poplar, birch and willow, although there are some scattered clumps of poplar and spruce of larger dimensions suitable for building purposes, particularly in township 52, range 10. There is a regular entanglement of small lakes throughout this contract.

The numerous hay marshes make this section of the country admirably adapted to ranching, and there are already several ranchers in this vicinity who appear to be doing well. The large amount of dead timber standing in several of the lakes show that in late years the water in these lakes has risen considerably. The greater portion of these townships is covered with small timber which can be easily cleared, and the soil which is black loam up to six inches in depth with sandy subsoil (although in places sandy loam is found with subsoil of sandy clay or gravel) makes a large tract of this land suitable for agricultural purposes. Fire-wood is abundant all through this section of the country. There is very little open country which is not muskeg or swamp, and except for the ranchers mentioned there are no settlers. North Battleford is the nearest place of any size where business is transacted, and Boutin the nearest post-office.

In addition to several branch trails to the different ranches there is a trail from Boutin post-office running through townships 50, ranges 9 and 10, and connecting with the trail from Witchekean lake to Marcelin, in township 49, range 11.

After the completion of this contract we moved into township 50, range 11, a portion of contract No. 13 not previously inspected. This township is for the greater part heavily timbered with poplar, willow and scattered clumps of spruce, and there are no settlers. There is a fine creek running through this township, and one or two inferior trails. We traversed a portion of Witchekean lake while at work here and then moved camp across Witchekean lake on the ice to township 53, range 9, in which we did some further inspection. The snow by now had become so deep that travelling on wheels was next to impossible, so I decided to stop work for the season and move into Shellbrook where I had made arrangements for the wintering of the outfit.

Marked advancement in settlement was apparent this season in every direction. Districts, that a few years ago were uninhabited, are now well settled. Railways are being built all through the country, and towns are springing up in every direction. Settlement and progress are very much in evidence, and the settlers seem prosperous and contented.

The townships surveyed this year will open for entry thousands of homesteads, and although the new country opened is for the greater part bush, there are many sections ready for cultivation.

During the season we had several days of excessive heat, on May 5, the thermometer registering 100 degrees in the shade, and on the 10th of the same month a severe snowstorm lasted twenty-four hours. On October 30, we were able to cross several lakes on the ice and November was also very cold, the mercury sinking to 36 degrees below zero on the 25th.

On June 2 wheat was up five inches. The greatest amount of rain fell during the month of July. On September 4 a heavy frost did great damage to crops in Saskatchewan, and on November 6 the snow was six inches deep and by the end of the month it was over two feet.

We did not perceive any indications of minerals or coal during the survey. Great quantities of game, both of the feathered variety and of deer, abound throughout this country, moose and elk being very numerous north of Saskatchewan river.



## APPENDIX No. 28.

## ABSTRACT OF THE REPORT OF A. LIGHTHALL, D. L. S.

## SURVEYS IN THE NEW WESTMINSTER DISTRICT IN THE RAILWAY BELT OF BRITISH COLUMBIA.

I arrived at Vancouver from Ottawa on April 18, 1911, and having purchased my supplies and organized my party I moved up the north arm of Burrard Inlet to Bedwell bay. The work here consisted of the taking of some levels in the townsite of Woodhaven which had been laid out by Mr. A. W. Johnson, D.L.S.

Woodhaven is beautifully situated. It is only a few miles from Vancouver, faces the salt water and has a plenteous supply of fresh water procured from a small lake about a mile inland. The surface is rolling and any land not required for townsite purposes would make excellent farm land.

Having finished the work there on May 10, I proceeded to Pitt lake to survey several timber berths and to mark out as much of the limit of the railway belt as could be conveniently reached from the lake. The land there is very mountainous and surveying was slow, considerable time being spent in travelling to and from camp. The work might be more expeditiously carried on if a larger party were employed and two or three men kept packing provisions continuously, as much time is always lost when the regular party are moving camp.

The land will never be good for anything but timber as it is sometimes hard to find a place level enough to pitch a tent. Game is fairly plentiful, consisting of goats, bears, deer and grouse. Considerable water-power could be developed on Rainbow creek, which has a drop of about eight hundred feet in a quarter of a mile, and at low water has a flow of approximately five thousand cubic feet per minute.

Our next work was along Silver creek which flows into Pitt river from the west side just at the foot of the lake. Along this creek a tract of low, wet land extends for about two miles from its mouth. It is about a mile wide and has been formed by a deposit from the surrounding hills. This land is covered at high water, rendering it unfit for agriculture at present; but by dyking, it could be made into a good agricultural district well suited for grain growing or dairying. The higher ground at the foot of the hill is heavily timbered but would make good fruit-farming land as the soil is very fertile. It is easy of access as New Westminster can be reached by boat. The rock formation is granite with evidences of iron and copper but no minerals have yet been found in commercial quantities.

After doing some subdivision work in township 4, range 5, west of the seventh meridian, we surveyed a timber berth on Harrison lake, about eighteen miles from the foot of the lake. Harrison river at that season was very shallow and swift, but in high water it is sufficiently deep for large steamers to run to the lake. The mountains, though as high as around Pitt lake being about five thousand feet above sea-level, are not so steep and rugged, but the timber is smaller. As there is little agricultural land around Harrison lake the logging industry is likely to be the only one which will flourish. A summer resort has been opened up at the hot springs at the foot of the lake, and the district attracts sportsmen as bears and deer are numerous.

Stave river, a part of which I traversed next, is a rapid stream and navigable only for about two miles from its mouth. The surrounding country seems to be well adapted to fruit-growing as it is rolling, very fertile and well drained. The Western Electric company have developed a fine water-power on this river and have transmission lines to Vancouver and the surrounding district.

Having finished the traverse of Stave river on November 16, I paid off the party, stored the outfit and returned to Vancouver.





*Photo by G. H. Hervey, D. L. S.*

Freighting on the trail from Prairie Creek to Jasper Park







## APPENDIX No. 29.

## ABSTRACT OF THE REPORT OF G. J. LONERGAN, D. L. S.

## INSPECTION OF CONTRACTS IN NORTHERN ALBERTA.

I reached Edmonton during the first week of April, 1911, and outfitting at once, started on the inspection of townships 62 to 66, inclusive, ranges 1, 2 and 3, west of the fifth meridian. There is a good trail from Edmonton to Belvedere and from this place there is but one road which gradually gets worse until you reach township 64, range 2, where it ends. In the above-mentioned townships there is some very good land in places. The northern part is chiefly sand ridges covered with jackpine and tamarack swamps, but the southern part is a clay loam mostly covered with heavy windfall. At one time this southern part was a spruce forest, but fire killed the timber and the wind blew the trees down making it almost impossible to get through. However it is only a matter of time till a second fire will burn up the windfall leaving the land ready for plowing.

My next work was a restoration survey of the northerly third of township 50, range 27, west of the fourth meridian. Most of this township is settled upon and as it is only about thirty-five miles from Edmonton with a fairly good road following the north bank of Saskatchewan river, it is easily seen that what land is left is practically useless for farming, although under the provisions of the provincial Drainage Act there are some very large marshes that can without much difficulty be drained and then the remaining quarter sections will make good farms.

While at this work I received your instructions to proceed to the Peace River district to examine the contracts there. It was now the end of June and as we had had a month of continual rain I knew that the trail would be practically impassable, I therefore arranged transportation for the party and outfit from Athabaska Landing to Grouard by steamer. During the winter travel over this trail is easy, there being no hardships for either men or horses. About every eight or ten miles along the road there are stopping-places, hay and stable accommodation and a bunk-house where the teamsters cook their meals and sleep, the charges being very reasonable.

Grouard, situated at the west end of Lesser Slave lake, is a settlement of about five or six hundred people. The Hudson's Bay company and Revillon Bros. have each a large store. There are also a couple of other merchants, two blacksmith shops, one drug store, two doctors, a telegraph office and a land office. The Roman Catholic mission have a large Indian school with two hundred children in attendance. The town being at the end of navigation and surrounded by a good farming country, is bound to be in the near future a place of some importance. The trail from Grouard to Peace River Crossing, a distance of about eighty miles, passes for the first forty miles through a thick poplar bush with scattered spruce both of which are large enough for lumbering purposes. The north half of the trail runs through more open country with large patches of prairie, and the soil changes from a clay to a sandy loam. Very little of this land is taken up. There are a few settlers with about three hundred acres broken, ready to crop in the spring of 1912.

Peace River Crossing is in a valley about six hundred and fifty feet deep. There are about a dozen houses, two stores, a post-office and a telegraph office. A cable ferry for teams, propelled by the current, crosses the river. There are two steamboats running between Fort Vermillion, one hundred and fifty miles down stream, and Hudson Hope, one hundred and fifty miles up stream. On the west side of the



river and about fifteen miles up stream in the valley are situated the Roman Catholic and Church of England missions and schools. They have beautiful farms producing and ripening all kinds of common vegetables and grains, also a flour mill where they do public grinding. Mr. Brick, a farmer located between the two missions, told me that he had successfully grown wheat for the past twenty-six years and it was never affected by frost.

Rising from the valley is a plateau about seventy miles by thirty miles in area, three-quarters of which is open country while the remainder is bluffs of poplar and willow scrub with a few scattered spruce. The soil varies from a clay to a sandy loam and in some places a heavy black loam. Settlers are scattered all along the trail from Peace River Crossing to Dunvegan, but there is room for thousands of others. I would not consider it advisable to start cattle ranching as the soil is too fertile and it will be but a few years till the country will be fenced up by farmers, and pasture lands will be as scarce as in the southern parts of the province.

At Dunvegan there is another cable ferry crossing Peace river, and south of the river valley begins the Spirit river district. The soil here is equal to the best I ever saw in Manitoba or Saskatchewan, about eighty per cent prairie, and farming is but in its infancy. I saw some unthreshed oats that would easily weigh forty pounds to the measured bushel. There is one store and a church in this settlement, and although the settlers are few, all whom I met were well satisfied that they had settled where they are. About fifteen miles south of the river is the north side of the Saddle hills, and for the next twenty miles the trail passes through thick poplar six to eight inches in diameter, with scattered patches of spruce ten to twenty inches in diameter. The hills in themselves are but slight elevations with no rocks. About the centre of township 74 is the north side of Grande Prairie. It extends from Smoky river on the east to Beaverlodge river on the west, and is bounded on the south by Wapiti river. It is about seventy-five miles long by thirty wide. In the west end there is less scrub and I would consider the soil better for farming, there being more black and sandy loam, while in the east the soil is chiefly a clay loam.

Grande Prairie settlement is situated in township 71, range 6, west of the sixth meridian. It has one large frame store, a school, a blacksmith shop, a land office, and a Roman Catholic church, with a dozen other houses. Its rival town, Beaverlodge, twelve miles west on Saskatoon lake, has Revillon's and Hudson Bay company's stores, a branch of the Canadian Bank of Commerce, a post office and a Church of England mission school. They also expect to have a telegraph office soon as the wires were up as far as Dunvegan last November. The settlers around Grande Prairie, like those along Spirit river, and between Peace River Crossing and Dunvegan, are scattered from one end of the district to the other making it quite clear that the soil is good all over, while each settler thinks he has the best location.

My next work was at Pouce Coupé prairie in the Peace River block. Leaving Saskatoon lake I went due west to Beaverlodge river, thence up that river to Sinclair lake, and from there a wagon trail was tracked through the scrub to Swan lake and down the south bank of Pouce Coupé river. This trail was but recently made and as there are no bridges across the many creeks, travelling was very slow. I can speak only of the southeast corner of the block. The surface of this part is rolling, the soil is a clay loam and about ninety per cent of it is prairie. From what I saw of it I would advise people who want to go in for cattle or horse ranching to settle here. Hay can be cut in abundance and there is ample supply of water in the creeks. Regarding frost the country is higher than the places previously mentioned but it being situated on the east end of the Pine pass it is reported that the warm winds from the coast protect it. There is but one settler in the district and he told me that spring was much earlier here than at Grande Prairie, with less snow during the winter.

Having completed the inspection of the contract I returned to Grouard and again loading up with supplies I started to inspect a contract west of Big Prairie settlement going as far west as Little Smoky river. From range 19 west of the fifth meri-



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dian eastward the country traversed is covered chiefly with poplar six to eight inches in diameter and scattered spruce, with occasional patches of willow scrub and a small amount of prairie. From Winagami lake west to Smoky river is a large tract of good farm land without a settler. I was informed by an old hunter that the good land extended north almost to Peace River Crossing. The soil is a sandy loam and the country is almost level with about fifty per cent willow scrub, the rest being open prairie. The pea-vine climbs up the willow scrub making a net-work very difficult to get through. The grass in this whole district cannot be surpassed by any in the western provinces. There will be no difficulty in obtaining water, as wells could be sunk anywhere and water obtained in less than twenty-five feet.

On November 16 the work for the season being completed, we broke camp and started for Edmonton going via Grouard and Sawridge.



## APPENDIX No. 30.

## ABSTRACT OF THE REPORT OF E. S. MARTINDALE, D.L.S.

## MISCELLANEOUS SURVEYS IN SOUTHWESTERN ALBERTA.

Having completed the organization of the party at Medicine Hat we proceeded to our first work in township 7, range 3, west of the fourth meridian.

This township lies immediately south of the forest reserve at the western end of the Cypress hills, and is broken by the valley of Lodge creek. This valley is about a mile wide and has banks varying from 300 to 400 feet in height. To the east of the coulee the land lies in a fairly level bench broken by ravines, which, in the northern portion of the township, are wooded with small spruce, and poplar and willow scrub; to the west, the country is rough and hilly. Most of the northern and eastern portion, the soil of which is loam, is taken up and is being rapidly fenced. The settlers are mostly English and German, and are following the methods of mixed farming.

The great drawback to this district is the uncertainty of obtaining sufficient moisture to grow and mature the crops. A few attempts are being made to irrigate in the Lodge coulee, but the supply of water available is not sufficient to allow of any extensive operations.

Retracement work was continued in township 7, ranges 4 and 5. Township 7, range 4, is rough and hilly and is used almost altogether for ranching purposes. Township 7, range 5 is not so hilly, and the western part is being taken up by settlers.

Wood for fuel can be obtained in the northern part of township 7, range 3, and lignite is found in some of the ravines of the same township. Many of the settlers obtain their fuel from a small coal mine which is being operated near Eagle Butte post-office in township 6, range 4.

In the latter part of June I was informed by parties living in the foot-hills, that conditions in the mountains were favourable for surveying. Accordingly the retracement work was brought to a close and the outfit was shipped from Seven Persons on the Crowsnest line of the Canadian Pacific railway to the town of High River. I proceeded to Calgary to purchase ponies and a pack outfit for use in the mountains.

Leaving High River on July 4, we reached township 17, range 4, west of the fifth meridian, the following day. A good wagon road runs westward from High River to the foot-hills and follows the north bank of Highwood river into the mountains. The country which a few years ago was used exclusively for ranching is now settled and fenced, and is devoted to the growing of grain. The rancher has been driven back into the foot-hills where he is protected from the further encroachments of the homesteader by summer frosts.

On July 6 the subdivision of township 17, range 4, was commenced, and, completing this a week later, the survey of township outlines was begun. This work was in typical foot-hill country, consisting of a succession of high ridges, more or less sparsely wooded with scrubby jackpine and poplar. Trap creek, a small swift mountain stream was crossed in section 25. The north boundaries of townships 17, ranges 5 and 6, were next surveyed. The main ridge of the Highwood range was crossed in section 35, township 17, range 6; it runs in a northwesterly direction at an altitude of from 8,500 to 9,500 feet. While in the Trap creek valley and before crossing the mountains, the block composed of sections 34 and 27, township 17, range 5, was outlined. The country along the eastern portion of the north boundary of range 5 is similar to that along the east boundary except that the ridges are higher and more rocky and are in some cases covered with small jackpine. Trap creek was again crossed in section 33. The first genuine mountain work was experienced here and extended partially across range 6.



## SESSIONAL PAPER No. 25b

An outcrop of soft coal, bright and clean, and apparently of good quality was noticed in the bank of Trap creek at the point where it is crossed by the east boundary of section 34, range 5. There is no timber worth mentioning in the Trap creek valley, except a small area at the head of the creek in section 36, range 6. However, the difficulties to be overcome in getting it to market are too great to make it of any commercial value.

In crossing the Highwood range it was necessary to move the outfit down Trap creek to Highwood river, then along the lumber company's road to their camp in section 21, township 17, range 6.

Highwood river is crossed by the north boundary of range 6 at the northeast corner of section 31. It is a swift mountain stream about forty feet wide and one and one-half feet deep. The country between the Highwood range and the river is similar to the foot-hills in appearance and consists of high sandstone ridges, which, generally speaking, run parallel to the river. It had been well timbered along the outline, but was overrun by the fierce forest fire of 1910. Practically all of the timber in townships 17 and 18, range 6, which was spruce and jackpine up to thirty inches in diameter, was included in timber berths Nos. 1429 and 579, while that in range 7 lies in timber berth No. 292. A portion of that in timber berth No. 292 lying near the British Columbia boundary escaped the fire. The Lineham Lumber company operating on timber berth No. 579, had one large camp working on the burnt timber last winter (1910-1911), and are also working on it again this winter.

The subdivision in townships 18, ranges 6 and 7, was completed on October 16, and we next proceeded with the subdivision in township 17, range 6, completing it by the middle of November.

The coal in the Highwood valley is found in the high sandstone ridges before mentioned. According to analyses which have been made, it is practically an anthracite. This field when opened up should yield a large supply of first-class household fuel. The district is readily reached and a railway into it could be built without meeting any serious constructional difficulties by following Highwood river into the mountains.

Several deer were seen, also some blue grouse, spruce partridge and ptarmigan.

The work of the Highwood valley being completed, we moved to township 19, range 7, by following up Sheep river. The subdivision was completed by December 1, and we arrived in High River on the 3rd.

After paying off the party and making arrangements for the wintering of the outfit, I commenced the small miscellaneous surveys in northern Saskatchewan, for which I had received instructions. On this work I was accompanied by one assistant. We first investigated the marking of a witness post on the north boundary of township 36, range 12, west of the third meridian. The land here is mostly settled and is used for grain growing.

We next traversed the south bank of South Saskatchewan river across township 48, range 24, west of the second meridian, and, after investigating the old traverse of the north bank, traversed that also. The country is partially wooded with small poplar and there has as yet not been very much settlement. A ferry is maintained at the point where the surveyed trail from Prince Albert crosses the river in this township.

The marking of a witness post near the southeastern end of Fish lake in township 52, range 4, west of the third meridian, was next investigated and the necessary corrections made. No settlement has yet been made in this township. The country is gently rolling, more or less thickly grown up with small brush and is also partially wooded with poplar. The timber has practically all been taken out from around the southeast end of the lake.

A resurvey of the south boundary of section 1, township 23, range 33, west of the principal meridian, was next made. This district is settled and some of the farmers have fine houses and barns. While engaged on this work the weather was very cold and severe and as mounding could not be done without serious inconvenience we closed operations for the season and arrived home on January 14, 1912.



## APPENDIX No. 31

## ABSTRACT OF THE REPORT OF H. MATHESON, D.L.S.

## RESURVEYS IN SOUTHWESTERN ALBERTA.

On December 3, 1911, I took over the party and outfit of Mr. G. H. Herriot, D.L.S., and began correction surveys in townships 52 and 53, ranges 21, 22 and 23, and township 52, range 24, west of the fifth meridian.

Athabaska river, which I traversed through these townships, runs northeasterly through townships 52, ranges 23 and 24, and townships 53, ranges 22 and 23. Its banks are from two to three hundred feet high. McLeod river, which has banks from forty to sixty feet high, and which I also traversed, runs easterly and northeasterly through townships 52, ranges 21 and 22 respectively.

The Grand Trunk Pacific railway runs between the McLeod and Athabaska rivers and the Canadian Northern railway company are building a parallel line a short distance to the north. Much of the grading is already done but no steel is yet laid. Most of the country was at one time fairly well timbered with spruce, pine, tamarack, poplar, and a little white birch, but owing to frequent forest fires a large part of this district is now covered with *brulé* and small pine. Merchantable timber still grows on the banks of the Athabaska in townships 52, ranges 23 and 24, along the Grand Trunk Pacific railway in ranges 22 and 23, and in the valley of McLeod river. Patches of good timber are also found in other parts.

The soil varies from almost pure sand to sandy loam and in places boulders are found. The surface of townships 52 and 53, ranges 21 and 22, is mostly flat and much of this area is covered with shallow muskegs which could be easily drained and which are wooded with small spruce and tamarack. Between the muskegs are sandy ridges covered with jackpine. No attempts have been made at cultivation but scattered bunches of good timothy near the railroad give evidence of the fertility of the soil.

The principal industry is making railroad ties where suitable timber can be found convenient to the railroad, and two sawmills are now in course of erection.

Many trails are found between the Athabaska and McLeod rivers, along which packhorses can travel, and roads were cut along the railway at the time of construction, so that travelling through this district is an easy matter.





*Photo by G. H. Herriot, D.L.S.*

Fiddle Creek Canyon—Jasper Forest Park Reserve.







## APPENDIX No. 32.

## ABSTRACT OF THE REPORT OF C. F. MILES, D. L. S.

INSPECTION OF SURVEY CONTRACTS AND MISCELLANEOUS RESURVEYS IN SOUTHERN  
SASKATCHEWAN.

Our survey operations for the season were commenced on May 6 at Many Island lake. The work there consisted of building monuments left unfinished last season when the dry bed of the lake was subdivided. Owing to the large amount of rainfall causing a greater area of the lake bed to be covered by water the expectations of the settlers with regard to the quantity of hay to be secured will scarcely be realized this year but under ordinary conditions I believe large quantities of hay may be obtained there. From there we moved to Bigstick lake where our work consisted of restoring some obliterated monuments in township 14, range 26, west of the third meridian. The trail we followed to this place passed through a grazing country and large flocks of sheep as well as horses and cattle were observed. No dwellings were seen although some of the land had been recently broken by homesteaders.

After completing this work and some retracement in township 16, range 27, west of the second meridian, I left for Edmonton and from there, on July 3, proceeded to the inspection of contract No. 22 of 1910, which consisted of townships 61, 62, 63, 64 and 65, range 18, west of the fourth meridian. On our way to this contract we passed through Pakan, a small settlement in township 58, range 17, west of the fourth meridian. This was formerly an old Hudson's Bay post and went by the name of Victoria. It has stores, a hospital, post-office flour-mill and blacksmith shop. A ferry crosses Saskatchewan river at this point and a mail coach runs to Lamont, a station on the Canadian Northern railway. From Pakan we proceeded north through Galician and Russian settlements. There we saw good crops and well fenced farms, and their thatched houses washed with white clay on the outside give the impression of thrift and industry. A portable sawmill was in operation at White-earth river.

The surface of the townships in contract No. 22 is rolling and interspersed with marshes and hay meadows. The soil consists of a layer of black loam of variable depth over a subsoil of sandy loam. The timber is mostly poplar and spruce with some tamarack in the muskegs.

After completing the inspection of contract No. 22 I made a partial inspection of contract No. 20 of 1910, which lies southwest of lac la Biche, and then proceeded to contract No. 26 of 1900, passing through Lac-la-Biche settlement. We reached township 63, range 10, west of the fourth meridian which is in the westerly portion of this contract and continued the inspection easterly. We then moved easterly along Beaver river to township 61, range 3, where we made some resurveys. While on our way to the latter township I went to St. Paul-de-Metis for supplies. This is the largest place north of the railway. It has several general stores, two hotels, two blacksmith shops and a number of other industries. A daily mail stage runs to Vegreville, which lies about sixty-five miles to the southwest on the Canadian Pacific railway.

Our next work was the subdivision of a portion of the west part of Cold Lake Indian reserve. West of the reserve the country is nearly all solid woods except where it is interspersed with sloughs or hay marshes. The reserve is mostly open prairie. Along the trails in the reserve, fields of grain, mostly oats, were seen, also some patches of wheat. Most of the wheat as well as some of the oats was injured by frost. Potatoes, however, appeared to be a successful crop.



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After resurveying a portion of township 62, range 2, we returned to contract No. 26, of 1909, which lies west of Cold lake and completed the inspection of the eastern half. This part of the contract is all wooded and the soil is generally light. Cold lake is a large body of water, said to be sixty fathoms deep and teeming with white-fish and salmon trout. Fishing on an extensive scale is carried on here in winter, the fish being taken on sleighs to the Canadian Northern railway, nearly one hundred miles distant.

I next inspected contract No. 14 of 1910, which lies northwest of Cold lake. The country in this contract is similar to that in contract No. 26 of 1909, except that the muskegs are more numerous and of greater extent. There are also a number of lakes, one of which in townships 65, ranges 2 and 3, covers approximately eight thousand acres.

We completed this inspection on November 7 and returned to Cold Lake settlement and thence to contract No. 18 of 1911, which lies southeast of Cold lake. The trail we followed passed through undulating country wooded with poplar and spruce. East of the fourth meridian the country passed was level and more open with a sparse growth of jackpine and scrub poplar. North and south of the trail the country is more heavily wooded. South of Mudie lake is all fairly level, being mostly hay meadows.

The inspection of contract No. 18 being finished we moved to contract No. 17 of 1911, and completed this work on December 7. We then proceeded to township 54, range 22, west of the third meridian, to perform some resurvey, following a good trail through partly open country wooded in places with poplar and jackpine. About nine miles from St. Walburg we saw the first settler and farther south found practically open prairie well settled.

As our next work was retracement in township 67, range 12, west of the fourth meridian, we left for Lac-la-Biche settlement via St. Paul-de-Metis. The journey, which occupied five days, was through fairly open country with plenty of hay except at the crossing of Beaver river.

Having finished this work and also some retracement along the correction line west of Egg lake, I proceeded with the inspection of contract No. 20 of 1910. The townships in this contract are very level with poplar woods predominating. It would seem that this section was best suited for mixed farming and cattle raising.

On January 26, 1912, we closed operations for the season and started for Athabaska Landing.



## APPENDIX No. 33.

## ABSTRACT OF THE REPORT OF A. L. MACLENNAN, D.L.S.

## SUBDIVISION AND MISCELLANEOUS SURVEYS AT LE PAS

The village of Le Pas, situated on the south side of Saskatchewan river, has a population of about 400. There are in the place several stores, a dentist, a newspaper office, schools, churches and two hotels. The Finger Lumber company has just completed the first section of a large sawmill. When completed they expect it to have a daily capacity of about 40,000 feet of lumber and to employ about 5,000 men. The spruce logs for the mill are obtained from extensive timber limits some 60 miles up Carrot river, a stream which flows into Saskatchewan river about two miles from Le Pas.

On the north side of the river and opposite the village is an Indian settlement with a population of about 450.

Our work consisted of the survey of a booming site on Carrot river for the Finger Lumber company, and subdivision surveys in township 56, range 25, and townships 56 and 57, range 26, west of the principal meridian. There are in these townships numerous lakes and sloughs, some of which, however, are very shallow. Reader lake in township 57, range 26, being only about three feet deep.

The soil is very light and in many places is merely light gravel covered by thick moss. Spruce timber grows very thickly but it is rather stunted. The surface is slightly rolling but is not hilly with the exception of a high ridge on the north bank of Saskatchewan river.

On account of the sandy nature of the soil vegetables and particularly potatoes, will likely be grown by the homesteaders settling in the vicinity of Le Pas. The extensive hay meadows which border the sloughs will enable cattle-raising to be carried on but cereals cannot be successfully grown unless some means of draining the extensive swamps can be found.

Whitefish, pike, pickerel and sturgeon are plentiful in Saskatchewan river and ducks are also numerous, while fur-bearing animals consisting of bears, foxes, mink and muskrats are found in considerable numbers.



## APPENDIX No. 34.

## ABSTRACT OF THE REPORT OF J. B. McFARLANE, D.L.S.

SURVEY OF PARTS OF THE FOURTH MERIDIAN AND THE TWENTY-FOURTH BASE LINE WEST OF  
THE FOURTH MERIDIAN.

I reached the northeast corner of section 13, township 95, range 1, west of the fourth meridian, where my work was to begin, on June 15. Work was continued on the meridian until September 27, the line being then completed to the north boundary of township 105. A pack-trail was cut this far north and a sleigh trail as far north as section 12, township 102. Here a cache was built for supplies near a small lake around which there was some good hay, and about two tons of this was cut. The intention was to freight supplies this far north, as soon as snow came, for the production of the line. This plan was frustrated by the fact that oats were not sent down the Athabaska as ordered. However, the line has been run through the most thickly timbered country and freighting can be done much easier from the north. Hay was also put up at all points along the line where any could be found. About twenty-two tons in all were put up and the greatest distance between places where hay was secured was from Clearwater river to the north boundary of township 95.

As the distance from the Clearwater to township 105 was too far to pack, being at least 120 miles by trail, the outfit was moved south on September 28 and reached the 24th base line on October 8. Here supplies had still to be packed from the Cascades on the Clearwater although the horses had been eating frozen grass for a month and a half, and hay was too far away to be used. By November 7 there was about five inches of snow on the ground and a load of supplies was taken from the Clearwater on sleighs, reaching the camp on the base line on the 13th. The sleighing was so poor that only supplies for the immediate use of the party could be hauled. On November 27 the 24th base line was completed across ranges 1 to 4, west of the fourth meridian, and a sleigh trail was cut from the meridian to section 35, township 92, range 4.

On November 28 we started for Prince Albert via the old Hudson's Bay company's winter trail from Clearwater via Methye portage, Methye lake, Buffalo lake, Ile a la Crosse, then by a new trail overland, crossing Beaver river at La Plonge, thence to Doré lake, Sled lake and DeLaronde lake. The ice was good on all the lakes and rivers but the northern part of the new trail was scarcely broken and consequently rough. On reaching the Hudson Bay company's post on Methye lake we got the oats left there by Mr. Wallace the fall before and as our horses had been on short rations they made the rest of the journey very well.

We reached Big River on December 19, and after waiting two days for a train we reached Prince Albert, where the party was paid off on December 22.

## DESCRIPTION OF THE COUNTRY ALONG THE FOURTH MERIDIAN.

The land along the fourth meridian from township 95 to township 99, inclusive, is close to a watershed and is composed of rolling sand hills. A number of creeks, all taking their rise within a few miles east of the meridian, flow westerly or northwesterly across the line. The creeks in general take their rise in muskegs. The small creeks generally have muskeg along their courses and often lose their channels crossing muskegs and form again where they have more fall. Creeks of medium size are in general dammed by beaver and consequently have a growth of willow and grass along their banks. This grass in the beaver ponds and old beaver meadows is the only hay in this district and is almost the only grass in all the country I worked in this season.



## SESSIONAL PAPER No. 25b

The larger streams, such as Firebag river, which crosses the northeast corner of section 25, township 96, have apparently enough water for the beaver without dams. Along these streams the entire river flats consist of wet muskeg from the water's edge to the rising ground forming the banks of the valleys. The water in all the streams is fresh and fish are plentiful in all the creeks and lakes.

The northeast corner of section 36, township 100, is crossed by Richardson river which is the largest stream the line crossed this season. This stream, at the meridian, is about 300 feet wide, three feet deep and has a current of about two miles per hour. It is called Jackfish river by the Indians and empties into a small lake at the southwest end of Athabaska lake. The valley of this river is deep, being about 550 feet lower than the hills in the southern part of township 100, and it is about a mile wide except where joined by creek valleys. Its sides are rough, broken hills. The river flows northwest and a rough range of hills crosses the line in township 101, running from the river northeasterly. The north side of these hills is rough, and broken with deep ravines. From here the altitude drops rapidly to the north as far as the meridian was run, indicating that the slope from here is towards Athabaska lake. Throughout township 102 the country is much the same formation, rough sand hills averaging about 200 feet above the valleys and ravines. On many of the hilltops throughout this country from township 95 to township 102 the sand is fine enough to blow but there is too much gravel and stones mixed with it to have shifting sand hills even where the timber is thin enough for the wind to strike the hills.

North of township 102 the country is different, townships 103, 104 and 105 are much nearer level and 103 and 104 especially are very stony and dotted with small lakes. On some of the small ridges in these townships no soil can be seen among the stones forming the ridges. South of township 104 very little limestone was seen but from the southern part of this township north, about one-third of the loose rock is limestone. No solid rock projections were seen but boulders up to ten feet in diameter were met with. In township 103, Old Fort river takes its rise a few miles east of the meridian and crosses the line on section 13. It flows through many small lakes, generally with several rapids between, and at some of these considerable power might be developed. Another small river takes its rise in the southern part of township 104, and flows northerly from a small lake on sections 12 and 13. This stream crosses the line on the east boundaries of sections 13 and 36, in township 105, and continues in a northerly direction. There are some rapids on this but I think none so valuable as on Old Fort river.

This stretch of country from township 95 to township 105 has very little protection from fire. The land is about nine-tenths sand with a growth of jackpine on it and the small muskegs, lakes or creeks wide enough to stop a fire are comparatively insignificant. There is therefore very little of this area that does not get burnt over on an average once in ten years, and consequently there is no timber of value. Nearly all trees six inches in diameter have been scorched several times. Their growth is stunted and they are dead on one side. There is a great deal of thick second-growth jackpine and in many places thick windfall. There is no open country as about three years after a fire the young jackpine is up thick enough to kill what grass has started on the fresh *brulé*. The soil is destroyed as well as the timber and the usual covering on the sand is one to two inches of moss and needles. The only timber of value noticed was a few small patches of fourteen-inch spruce and ten-inch birch, poplar, balsam and jackpine on sections 1 and 2, township 101, on the slope of the north side of the valley of Richardson river. On account of the predominant sandy soil this country is not suitable for agriculture. The muskegs that can be drained might form good soil but these form a small proportion of the land. Summer frosts were prevalent and the season short. Rain was plentiful but generally in small or drizzly showers. There is enough fall to all creeks so that no land is flooded but the water in the muskegs rises or falls according to the amount of rain. The country is in general roughly rolling to hilly and the depth and width of the valleys, the sides of which



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are generally steep, increase with the size of the streams in them. Wood fuel is everywhere plentiful, but no minerals were noticed. Game is fairly plentiful throughout this country, and fine specimens were seen of moose, caribou, bears, wolves, foxes, beaver, mink, marten and ermine. The three latter are very small for their species. Chickens and ducks are also numerous. All this country is an old Indian hunting-ground and the whole country is traversed by hunting-trails mostly running in an easterly direction and consequently of no use for survey trails.

## TWENTY-FOURTH BASE LINE WEST OF THE FOURTH MERIDIAN.

Ranges 1 and 2 along the 24th base consist mostly of rolling sand hills covered with small jackpine. From the west side of range 2 the water flows north, while from the east side of range 1 the water flows southwest. The divide between the water flowing north and the water flowing into Clearwater river crosses township 93, range 1, and the northwest part of township 92, range 2, in a southwesterly direction, around a large muskeg basin emptying north including the most of township 92, range 3, and thence to the northwest over the large plateau called 'Muskeg mountains.' Townships 92 and 93, range 3, are taken up largely with a basin containing jackpine, spruce, tamarack and birch, which nowhere averages above six inches in diameter. It has a gentle slope to the east and empties to the north. This basin looks like a wide depression through which a large creek would flow to the south into High Hill river. But the hills to the west are the highest in the locality and as the rise is gentle and unbroken the hills look much lower than they are. Range 4 is on the top of the 'Muskeg mountains.' The base line passes over the summit at the middle of the range reaching an altitude of 2,330 feet. The plateau consists of stony stretches of sand almost level, with patches of muskeg and the whole is covered with jackpine, spruce and tamarack averaging less than six inches in diameter.



## APPENDIX No. 35.

## ABSTRACT OF THE REPORT OF GEO. McMILLAN, D.L.S.

## SURVEY OF THE TWENTY-FIRST BASE LINE ACROSS PEACE RIVER BLOCK.

The survey of the twenty-first base line was begun on March 31, 1911, at the northeast corner of township 80, range 13, west of the sixth meridian.

The monument marking this corner which was 16.70 chains too far south was moved into correct position and from this point the base line was produced westward.

Half a mile west of the starting point is Pouce Coupé river, a swift stream about 110 feet wide. It rises in Sucker lake and flows into Peace river about twelve miles north. The valley is two miles wide and about 550 feet deep at the base line, the depth increasing all the way to Peace river. Along the river high rocky banks and river flats alternate.

The soil in range 13 is principally clay, the vegetable loam having been burnt away, and nearly all the timber is fire-killed. This dead standing timber consists of jackpine, spruce and poplar varying in size from four to sixteen inches in diameter. There is hardly any fallen timber as the trees have not been dead long enough to fall. Range 13 is the roughest part of the base line, there being two deep valleys. The deeper one is made by Pouce Coupé river while the other one, three miles west, is almost as deep, although the stream in the latter is only a few feet wide.

The surface in range 14 is undulating with no ravines, and the soil and timber are more thoroughly burned than in range 13. The north limit of Pouce Coupé prairie is about three miles south of the base line and runs in a southwesterly direction, the timbered area widening to the south of the line as far west as the Kiskatinaw river in range 16. Peace river is about nine miles north of the line and the Kiskatinaw flows into it about the middle of the range. For the first two miles north there is a series of beaver meadows and for the remaining distance to Peace river there is heavy green spruce up to thirty inches in diameter.

The soil and surface of the east half of range 15 resembles that of range 14, and in section 33 commences a forest of spruce, jackpine, balsam and poplar extending with one interruption to Pine river. This forest comprises about two hundred square miles of timber up to forty inches in diameter and is accessible to Kiskatinaw and Pine rivers. The other streams between these two rivers are not large enough for rafting logs and it is probable that they dry up in summer. The soil in this forest is a sticky clay loam covered with a thick green living moss which holds the moisture and which must have protected the timber from destruction when fires destroyed so much surrounding it.

Kiskatinaw river is crossed by the base line in section 35, range 16. It has its source near that of Red Willow river and is very crooked and swift. It has a stony bottom and a valley about two miles wide and 550 feet deep. It cannot be forded in high water and on May 2 its waters were so charged with sediment that they resembled black ink and were totally unfit for drinking. In its banks are some thin seams of coal, lumps of which are constantly falling into the water. To the west of the river the line runs through about eight miles of large scrub, small poplar and some large green spruce, the heavy forest previously referred to being to the north. Near the east end of the north boundary of section 32, range 17, the base line crosses the pack-trail leading from Fort St. John to Pouce Coupé and Grande Prairie. This trail seems to be very old and is the leading thoroughfare for hunters and others going to and from Fort St. John. From Kiskatinaw river to Grande Prairie this trail has been widened and improved into the present wagon road.



The district from the Fort St. John pack-trail to Pine river comprises part of the green forest already referred to. It is from from four to nine miles wide and about twenty-four long including ranges 18, 19, 20 and four miles in range 21. To the north and south of this green timber the surface is rolling and covered with thick large scrub of willow and poplar and patches of second growth poplar, jackpine and spruce.

Pine river is intersected by the base line in section 32, range 21. It rises in the mountains and is the second largest stream in the Peace River block. It has a stony bottom, is from ten to twenty chains wide and twenty feet deep at high water, and has a valley two miles wide and seven hundred feet deep. There are some prairie flats along its course where much hay can be procured and back of these flats are high, bare hillsides producing pea-vine and other grasses excellent for pasturage.

From Pine river to Moberly river, a distance of about thirteen miles, the surface is rolling and scrubby with occasional patches of large spruce. There are some small swamps that can be easily drained and in some places hay can be procured. The soil is suitable for stock-raising and farming. Water is abundant and there is plenty of timber for fuel and other requirements.

Moberly river was crossed in section 32, range 23. Its banks are low, resembling those of eastern rivers, and the water is of a light brown colour. It has a swift current, is about 100 feet wide and two feet deep in the rapids and can be forded almost anywhere. It has its source in Moberly lake about twelve miles south of the base line and flows northeasterly into Peace river.

„From Moberly river to the western extremity of the block the soil becomes more sandy and is timbered with spruce, poplar and jackpine of medium size except in the valley of Peace river where the trees reach thirty and forty inches in diameter. The soil in the Peace river valley is of the very best quality, there being in some places about two feet of vegetable loam. The pack-trail from Moberly lake to Hudson Hope is reached near the northwest corner of section 32, range 25. It is a very old and well-beaten trail and is in good condition.

The Peace river valley is entered about the middle of the north boundary of section 36, range 26, the last mile of the 21st base line being in the valley. The last post was planted at 38.40 chains west of the northeast corner of section 35 on August 12, and the same day a start was made on the west boundary of the block.

Adjoining the west boundary from the 21st base south there is no land suitable for settlement except a strip about one mile wide along Moberly river in section 27, township 78. This strip is good as far east as Moberly lake, a distance of about three miles. The surface of the remainder is hilly and the soil swampy or stony. In township 80 there are some spruce up to thirty inches in diameter but through townships 79, 78, 77 and 76, no valuable timber was met with. These townships are largely covered with willow scrub of large size and so thick that the tops and branches have grown together in such a manner that they have to be pulled to the ground after being chopped off. There is also considerable small poplar, jackpine and spruce which are of no value.

There is a small lake near the north boundary of township 79 and about two miles east. This lake is about one hundred chains long and forty chains wide and is surrounded by a floating muskeg.

Moberly lake, which is about fifteen miles long and four miles wide, is situated in townships 78, ranges 24 and 25, and is the most important lake in the Peace River block. It contains large numbers of whitefish, jackfish and trout while innumerable geese and ducks are found on its waters. On the west and north sides there are ridges about half a mile from the lake, the intervening space being a scrubby prairie. On this prairie are found wild fruits, such as cherries, strawberries, raspberries, saskatoon berries and blueberries. I saw there also potatoes, turnips and radishes which were equal in size to those grown in Ontario and which had been matured without injury from frost.



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The southwest corner of the block is on a bare sidehill and is about 120 chains from the west branch of Pine river. The survey was completed on October 10 and the next day with the party I left for Edmonton.

The route followed was the Pine river pack-trail which leads to Pouce Coupé and traverses the prairie nearly all the way. For about twelve miles this trail follows Pine river valley then turning north follows the prairie above the valley uniting with the trail from Moberly lake to Pouce Coupé, about range 22. It is a good trail all the way and there are good fords across Pine and Kiskatinaw rivers.

That agriculture can be successfully carried on in the Peace River block seems very probable. The soil seems well adapted for raising crops, the climate alone being doubtful. Although crops of last season were frosted, the area under cultivation was very small and that is hardly a fair test for a large area. The rainfall was excessive and the crops, slow in maturing, were caught by the frosts. There is a prairie west of Kiskatinaw river which I think is as large as Pouce Coupé prairie. It comprises a valley beginning at the river and averaging from four to ten miles wide and with a few interruptions extends to the southwest corner of the block. The soil is good and is suitable for agriculture and stock-raising. There are blue-joint meadows, wheat grass and other wild grasses in abundance. The scrub lands, except in range 26, are also good but hard to clear.

The timber lands comprise the forest previously referred to and also some valuable timber in all the river-valleys. I think it hardly necessary to retain this forest as a timber reserve as there is plenty of timber scattered elsewhere to meet the requirements of settlers.

Pouce Coupé, Kiskatinaw, Pine and Moberly rivers contain a permanent supply of fresh water and water-powers can be developed on them all. The permanency of the supply of the smaller streams is doubtful, depending to a great extent upon whether the season is wet or dry.

Shale rock and thin seams of coal appear in the banks of all the rivers, but no other minerals were met with although there is said to be a limestone deposit on Pouce Coupé prairie.

The game consists of moose, deer, partridges and prairie-chickens, and the fur-bearing animals are the black bear, grizzly bear, lynx, otter, beaver, marten, mink, fox and weasel.

The spring season was cold and backward in the timber lands and the snow remained till May 1. On Pouce Coupé prairie there was considerable new grass as early as May 15; the first summer frost occurred on July 19 and frequently after that date, while four inches of snow fell on September 12.



## APPENDIX No. 36.

## ABSTRACT OF THE REPORT OF A. L. McNAUGHTON, D.L.S.

## MISCELLANEOUS SURVEYS IN WESTERN ALBERTA.

My survey operations for the season were commenced on July 21, 1911, the first work being in township 46, range 19, west of the fifth meridian. After carrying on subdivision here for about three weeks I moved to township 45, range 20, and surveyed the east outline. The route followed to this township was along the bed of Southesk river. This would have been impassable at high water as the stream had to be crossed and re-crossed several times.

Our next camp, on Pembina river, was reached by an old trail over the hills. A splendid view of the Rocky mountains may be obtained from this trail. On a clear morning the bare hilltops permit an unobstructed view of a hundred miles of snow-topped peaks glistening in the sun. From here we continued subdivision work in township 46, range 19, until October 5. During this period we had a three days' snowstorm which lasted from September 20 to 22. From that time on, however, the weather was fine.

On October 6 we moved camp to Coal creek and from this date until December 20 we were engaged in the subdivision of land contiguous to the Alberta Coal branch of the Grand Trunk Pacific railway. From there we moved camp over the frozen muskegs to the north boundary of township 46, range 19, and by December 30 had completed the subdivision of the northerly two-thirds of this township, with the exception of the correction line.

We then left for Edmonton, via Edson, arriving there on January 4, 1912.

Up to the present the district surveyed has been reached by pack-trail from Big Eddy, a place on the main line of the Grand Trunk Pacific railway. This trail, which is in poor condition, follows McLeod river southwest from Big Eddy to the mouth of Embarras river, thence up this river about five miles, where it divides, one branch following the west fork of the river to township 48, range 21, and the other following the east fork to township 47, range 19. Another trail running southeasterly from township 48, range 21, connects the termination of these two trails. About forty-five miles of wagon road was also built last spring along the branch line of the railroad, but it was almost impassable in the wet season. It is expected that the railway will be in operation next spring as far as township 49, range 21, and will be completed to township 47, range 19 during the summer.

The north part of township 46, range 19, is nearly level, consisting of muskeg and intervening ridges of jackpine. Toward the southwest the country becomes more hilly, rising into high ranges on the south and west boundaries. This is one of the few areas in the district which show no trace of having been swept by forest fires. Green spruce and jackpine predominat  but are of no immediate commercial value. At the forks of the Pembina and westerly along the river are occasional meadows which afford good pasture during the summer months. An outcrop of coal was seen on the south bank of Pembina river, about half a mile west of the mouth of the Little Pembina. This land has been leased to the Pacific Pass Coal company.

The Alberta Coal branch through ranges 20 and 21 traverses a broken hilly country following a chain of valleys considerably lower than the surrounding hills. These hills occasionally rise five or six hundred feet above the valleys. The most prominent range parallels the railway on the north side and is a continuation of the watershed between the Embarras and Pembina rivers in township 47, range 19. Southwest of



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the railway in townships 47 and 48, range 20, the surface rises through irregular hills to a nearly level plateau, which extends a few miles to the south. In range 21 this plateau is again lost in broken hills. The district throughout is covered with *brulé* and second-growth jackpine and is no doubt underlaid by the same seams of coal which outcrop in township 47, range 19, and township 49, range 21. Good pasture is found on some of the bare hillsides, two or three miles north of the railway and especially in the northwest part of township 48, range 20.

The east boundary of township 45, range 20, traverses a broken hilly country. Beginning at the twelfth base line, which is at this point about three-quarters of a mile north of Brazeau river, a gradual ascent of half a mile leads to the top of the range dividing the Brazeau and Southesk rivers, and a broken descent of two miles to Southesk river follows. This river apparently has a glacial source, as its water has the characteristic blue colour of such streams and is very cold. The river flows between high cut banks and the current is very swift. Continuing, a broken ascent of two miles along the line leads to the watershed between the Southesk and Pembina rivers. There is a very noticeable difference between the waters flowing into these two rivers. The Southesk waters are very clear, while streams flowing towards the Pembina are discoloured by vegetable matter. This difference is probably due to a greater rainfall in the Pembina valley and consequently a more luxuriant growth of mosses. North of the divide there is a broken descent of two and one-half miles to Pembina river. The south four miles of the east outline of township 45, range 20, passes through a burnt country covered with *brulé* and small jackpine. North of this the outline passes through green spruce and jackpine, also of small size.

The soil throughout the district surveyed is for the most part a sandy clay or loam and is saturated with water, especially in the green bush and on the northern slopes of the higher hills. I have seen a packhorse mired on a fresh trail along a hill-top. This indicates the presence of a soil almost similar to quicksand. However, this is exceptional as there is generally firm footing, except in muskegs.

During the summer months rain-storms, and especially showers in the afternoon, are very frequent. No matter how fine the morning there is always a probability of a shower before night. The clouds are formed on the mountain tops and travel some distance eastward before breaking. Owing to the elevation, there is a possibility of frost on clear nights at any time of the year. The fall weather is, as a rule, very fine, especially during the months of October and November and, owing to the greater strength of the chinook winds, the winter is not so severe as in the prairie country.

The greatest asset of this district is the immense areas of coal beds. Seams up to fifteen feet in thickness have been found and worked and the coal is of good quality for steam purposes. There are possibilities for the development of water-power on the Brazeau and Southesk rivers, but on account of the abundant supply of coal, capable of being economically mined, such development is unlikely in the near future.



## APPENDIX No. 37.

## ABSTRACT OF THE REPORT OF T. S. NASH, D.L.S.

## INVESTIGATION SURVEY IN SOUTHWESTERN MANITOBA.

On September 11, 1911, I was instructed to proceed at once to make an investigation of the survey monuments in township 2, range 21, west of the principal meridian. I accordingly left Ottawa on September 12 and arrived at Boissevain three days later.

This place is a thriving little town at the junction of the Great Northern and Canadian Pacific railways, and is surrounded by an excellent wheat-growing district. As threshing was in progress at that time I was able to secure the assistance of only one man in that vicinity, but after reaching the township where I was to work I obtained the help of another man with his horse and rig. The township is favourably situated for agriculture, being on the northerly slope of Turtle mountain. The northerly half of the township being prairie, was almost all under cultivation, more than half of the boundaries were fenced and many of the road allowances were improved, some being graded. The owners for the most part live in well-built houses of brick or stone, have excellent barns and fine stock and enjoy a very good telephone service. Practically all the monuments in the northerly half still exist or their positions are indicated by fences or crop lines. The southerly half of the township was formerly covered with heavy bush and only wooden posts were planted in the original survey. As this district has been repeatedly swept by fire, no trace whatever remains of the old lines or posts. The settlement in the southerly part is more recent. Much of the land has to be cleared of *brulé* and scrub before it can be broken, so that the proportion under cultivation is much less. A fine second growth of poplar is springing up in many parts under the protection from fire afforded by the cultivated areas. This is in marked contrast to the condition observed in the Turtle Mountain forest reserve in township 1 adjoining, where fires continue to keep all second growth eradicated.

The soil throughout the township is a black clay loam producing excellent crops of wheat, oats, barley and vegetables.

The lack of survey monuments in the southerly half of the township is a source of much dissatisfaction to the settlers, as they do not wish to do any breaking ground beyond their proper boundaries, nor to do any permanent fencing till they know where their boundaries are. As it is not known where the road allowances are, there is but one road, which is at all improved, opened through the bush. This lack of proper roads and bridges is a great drawback to the settlers as it is only with great difficulty that they can market their produce.

Having completed the search for monuments, I returned to Ottawa, arriving there on October 2.



## APPENDIX No. 38.

## ABSTRACT OF THE REPORT OF T. H. PLUNKETT, D.L.S.

## LEVELLING ALONG FIFTH MERIDIAN AND ADJOINING BASE LINES AND MISCELLANEOUS SURVEYS.

My instructions were to complete a line of spirit levels along the fifth initial meridian from its intersection with Athabaska river in township 71 to the north boundary of township 112, over the twenty-ninth base line in range 1, and the twenty-eighth base line through ranges 1 to 17, inclusive. In addition certain corrections were desired on the meridian and some incomplected monuments were to be built.

The previous experience of surveyors showed that this country should be entered while the frost is still in the ground and preferably over the snow in early spring. Accordingly on March 14 I left Edmonton for Wabiskaw where I was to begin work, arriving there with my outfit and supplies on the 23rd.

I had intended travelling on the ice on Wabiskaw river, one hundred and fifty miles to its intersection with the fifth meridian, but owing to the great depth of snow early in the season, the ice was not strong enough to bear horses. As sufficient dog teams could not be obtained, we were compelled to wait until boats could be used. In the meantime we hired two dog teams and ran levels south from Wabiskaw along the fifth meridian to Athabaska river.

This work was completed on May 6 and the main camp was again reached on May 13. The boat which we had built was then loaded and sent in charge of my assistant to township 91, where the river intersects the meridian, while I with the remainder of the party ran levels north from Wabiskaw.

Considerable trouble was experienced navigating the river owing to low water, but by May 26 our provisions were safely stored at the intersection of the river and meridian in township 91, and the party reunited in township 83.

Our way ahead now seemed clear for at least ninety miles of work but about this date the almost incessant rains which characterized this season in the West commenced and very soon the swamps and muskegs began to delay us and continued to seriously hamper our operations as well as make life miserable for the party.

Work was carried on under these conditions until township 104 was reached. Here the swamps and muskegs became less numerous and although the rain continued until August 21 the wading through the foul-smelling swamp water was so greatly decreased that the party seemed to revive and take renewed interest in the work.

Peace river in township 111 was reached on September 6, and as our packhorses began to show the ill-effects from their long journey it was decided to give them a much-needed rest. Good pasture lands being convenient the remainder of the meridian north of Peace river, and the 29th base line, were completed without the aid of ponies, supplies and a limited camp outfit being packed by the men.

On our return to the 28th base line on September 20, our horses showed a great improvement and work was continued on the base line until October 2, when four ranges had been completed.

It was now considered advisable to commence our long journey homeward. Frost had come fairly early and the horse feed was not as good as it would otherwise have been at this date. The long trail between us and Edmonton made us doubtful if our horses would stand the journey if exposed to the severe cold which we would surely get if we remained later. Severe weather did overtake us even with our early start but fortunately not until we had reached Wabiskaw where hay was available.



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On our arrival at Wabiskaw on November 4 we found that the season of 1911 had been the wettest for twenty years. Hay was scarce, it having been found impossible to cut the large meadows in the vicinity of Wabiskaw lakes owing to their flooded condition, while the continuous rains had prevented the proper curing of large quantities of hay obtained farther back from the settlement.

Regarding the agricultural adaptability of the country traversed by me this season, little need be said. The report of Mr. A. W. Ponton, D.L.S., appearing in the annual report of the Topographical Surveys Branch for 1908-9, deals fully with this question. A copy of that report I found invaluable to a stranger penetrating this wilderness, and, having referred to it constantly during my trip, I can fully endorse his views on the suitability of this country for agriculture. The general information supplied by him regarding the country was found most accurate and greatly facilitated our work this season.

According to the present inhabitants of this district the spring of 1911 was unusually late. Growth at Wabiskaw did not commence until May 15, and it was almost June 1 before any green feed was available for horses north of Wabiskaw, but on May 6 grass had attained a growth of four inches at the intersection of the fifth meridian and Athabaska river in township 71. Once commenced, however, the grass and foliage came out rapidly and by June 20 these were at their best.

Frost at night continued until May 29, but after that date no frost was noticed, with the exception of a degree or two on July 20, until August 25 and 26, when a severe frost occurred in township 109, which seems to have been general.

September was, generally speaking, a fine month. Frost at night occurred on the 9th, 18th, 19th, 20th and 21st, while on the 20th snow fell to a depth of three inches, but this was all gone on the 23rd.

October, until the 18th, was exceptionally fine, frost occurring only on the 2nd, 3rd and 4th. On the 18th we experienced a severe northwest gale, snow falling to a depth of six inches on the high land in township 95, and after that date frost was experienced nightly while the swamps were frozen sufficiently to bear ponies after the 25th.

November was very cold, snow falling to a depth of four or five inches on the 6th, 7th and 8th, with the thermometer at zero at Wabiskaw. The weather became steadily colder until the 15th when 40 degrees below zero was experienced by the party on the summit of Pelican mountains; after that date, however, the weather moderated although winter weather prevailed throughout the month.

The spring of 1911 came on very dry. No rain fell during April, and May, with the exception of light showers on the 5th, 9th and 29th, was also dry. A violent rain and hail-storm occurred on June 2 which flooded the swamps and muskegs rendering the pony trails very heavy and in places impassable. In June there were twelve days during which heavy rains occurred and July was also very wet, rain falling on seventeen days, while during August rain fell on every day of the first twenty except the 19th. The remainder of the month was fine and comparatively dry.

It was found that comparatively small areas along the meridian are at present fit for settlement and these locations are at present so isolated and so difficult of access that it is highly improbable that settlers will find their way to them over the route followed by me this year.

Many first-class locations are to be found north of township 104 and west along the 28th base and these are easy of access compared with the country between Wabiskaw post and township 104.

Practically the whole country as far north as township 106 is covered with moss from six inches to two feet in depth. This moss has prevented the water from draining off the land, acting very much like a huge sponge, and has given it its swampy nature. The fact that so much of this swamp and muskeg exists should not lead to the conclusion that it is a flat country, presenting difficult drainage problems. This is not at all the case and the presence of the greater number of these wet areas



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is in my opinion altogether accounted for by the presence of the moss. I have found in many places almost impassable swamps on slopes of from ten to fifteen degrees. In some localities where forest fires have occurred during very dry seasons the moss is removed and the country is now dry and ready for settlement.

While at the confluence of the Red and Peace rivers I was told by the Hudson Bay manager there that the Indians in that country are burning a crude oil but the location of their supply is as yet known only to themselves. An attempt to obtain samples of this oil was unsuccessful.

Game is abundant. Prairie-chickens were seen as far south as Wabiskaw while grouse were very numerous all along the meridian and from township 100 north. Rabbits too are much more plentiful than for some years previously and this according to the fur traders bespeaks a much larger yield of fur in the near future.

All through the country the beavers are rebuilding their dams and appear to be increasing rapidly in numbers. Moose, caribou and bears appear to be plentiful except north of Peace river where the Indian hunters complain of the ravages of wolves among the young caribou and moose. No wolves, however, were seen by the party.



## APPENDIX No. 39.

## ABSTRACT OF THE REPORT OF A. W. PONTON, D. L. S.

## SURVEY OF PART OF THE PRINCIPAL MERIDIAN.

On March 2, having completed my organization and secured the necessary outfit including dogs and dog-sleighs, we took train from Selkirk to Gimli, where supplies had already been forwarded. There two teams of horses with bob-sleighs awaited us, and on March 3 a start was made for the North.

The route followed was from Gimli to Icelandic River settlement by ice, from Icelandic River by trail across country to Fisher Bay settlement, from Fisher Bay on the ice following the west shore of the bay to Stony point and around this point to my starting place on the meridian in township 35. From Gimli to Stony point there is a well-established winter road followed by freighters hauling fish from Outer Sturgeon and Reindeer islands to Gimli, and stopping places occur at intervals of about fifteen miles. On the 13th a start was made on the meridian and work proceeded until the 20th, when I decided to dispense with the services of six dog teams and their drivers, as it had become evident soon after passing Berens island that it would be impossible to obtain a sufficient supply of fish to feed the nine teams of dogs with which I had started.

Having reduced my transportation to three dog teams, the line was continued from day to day as the weather conditions permitted until the mainland on the north side of Big Black River bay in section 36, township 48, was reached on April 4.

On the 5th an attempt was made to produce the meridian on the mainland, but the snow was found to be too deep in the bush and too wet to proceed farther with the limited means of transportation at my disposal. At the same time I had been compelled to cache the greater part of my supplies far behind on Burton island. These supplies could not be brought up unless we could depend on the winter temperature continuing late into the month.

Having decided to return to Selkirk to await the opening of navigation, and to obtain a party and outfit, including canoes, suitable for carrying on the work under summer conditions, I started for the south on April 6, reaching Berens river on the 8th. There my dog trains were dispatched to Burton island to secure supplies and iron posts from cache, and on their return these were stored at the Hudson's Bay company's post, a port of call for steamers. Burton island can be approached only by tugs. I was delayed a couple of days at Berens river, owing, first to water on the ice, and then to a violent blizzard, but on the cessation of the latter the water had disappeared off the ice and on the 15th a start was made for Gimli, which was reached without incident on the 20th. On the following day we arrived at Selkirk, where my small party was paid off, with the exception of my two assistants. The chief incidents of such a campaign on the ice are blizzards and snow-blindness. I was fortunate with regard to the former, being actually caught only once without some shelter other than that which a tent affords, but with regard to snow-blindness, the picket man and myself were the chief sufferers, owing to the constant necessity of removing our coloured glasses.

The opening of navigation was unusually late in the spring of 1911, owing to the low temperature which continued throughout the month of May, and it was June 6 before I could get passage by steamer to Big Black river. Work was resumed on the meridian on the 10th and continued without interruption, other than delays caused by difficulties of transportation, until September 28 when the sixteenth base line was reached. During September the weather was cold and disagreeable, rain falling on seven and snow on two days. The country being generally floating muskeg, ice would form at night which had to be broken with the feet at every step, and much



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endurance was required to stand in ice cold water all day. Transportation was thus rendered almost impossible, and supplies could no longer be kept up at this particular season. With the limited supplies on hand, I decided to make an effort to run the sixteenth base line far enough west to intersect Nelson river, or for about six miles, with the view to making both the meridian and the base line more accessible whenever their further production might be required. However, after running it nearly two miles, bad weather in the form of rain, snow and fog, caused delay which threatened to bring about a famine, and it became necessary to pick up our packs and make for the river to get in touch with Norway House by means of canoes as soon as possible. I had also, previous to this date, received notice from the Northern Fish company that it would be necessary for my party to be at Warren's Landing by October 11 to catch their steamer *Wolverine*, which would make her last trip to Selkirk on that date.

Arriving at Nelson river on October 1, we waited till the 5th for the arrival of a motor boat from Norway House. After proceeding up-stream in this boat for a couple of miles the motor failed, but by good fortune a York boat happened along and by travelling all night we were enabled to reach Norway House on the morning of the 6th. From this post we travelled by the Hudson Bay steamer *Highlander* to Warren's landing, and from there by the steamer *Wolverine* to Selkirk, where my party was paid off.

The country along the meridian between townships 48 and 60 was found to be all of the same general nature—low, with swamps and muskegs alternating with outcrops of rock of the Laurentian formation. These outcrops invariably run in a northeast and southwest direction. Patches of dry ground covered with spruce from two to eight inches in diameter were occasionally met with, but in no case were they observed to cover any large area. The soil in such cases was sand or frozen clay. The soil throughout is generally black vegetable muck, which, even in event of draining, cannot be regarded as suitable for agriculture. Along the banks of the Belanger, Gunisac and McLaughlin rivers occasional patches of sandy loam occurred where farming could be followed on a small scale.

The country is timbered with spruce, jackpine, tamarack, poplar and birch, but in no instance was it found of sufficient size for milling purposes. Evidences of recent fires were observed, but on the whole they have not spread far owing to large areas of open muskeg. Timber cannot reach a greater growth than six to eight inches, as the roots rest on perpetual ice. In view of the approaching scarcity of timber, the drainage of this country may be a profitable investment at no distant date. Jackpine is confined to the rock areas, but none of sufficient size for railroad ties was observed.

There are apparently no beaver meadows and the only hay is muskeg grass.

The water is generally very clear and good, and this applies even to the muskegs. Few creeks were crossed, and all were small. Belanger, Gunisac and McLaughlin rivers are fine streams averaging one hundred feet in width. These streams are of varying depth and have no perceptible current, except in the vicinity of small falls, which occur at intervals.

Water-powers with heads of from two to ten feet can be obtained on these rivers, with apparently a permanent supply of water.

The climate cannot be judged by the weather conditions of 1911, as they were unusual throughout Manitoba, Saskatchewan and Alberta, a late spring being followed by poor ripening weather. Potatoes of excellent quality are grown at Norway House.

This district lies within the Laurentian area, and the rock, being massive and without cleavage, is not generally suitable for building purposes.

No minerals of economic value were observed and the Laurentian rocks seem unpromising in that direction.

Game of the feathered variety is plentiful. Ducks abound along the rivers in their season. Several cow moose were seen and, I understand, that both moose and caribou are numerous.

Fish is the staple food of the Indians and the supply seems to be always plentiful.



## APPENDIX No. 40.

## ABSTRACT OF THE REPORT OF R. C. PURSER, D.L.S.

## MISCELLANEOUS RESURVEYS IN MANITOBA, SASKATCHEWAN AND ALBERTA.

A considerable portion of the season's work consisted of the survey of lakes which had never been plotted and in the investigation of lakes that had wholly or partly dried up since the original survey. To the former class belong the surveys made in township 25, range 9, west of the principal meridian, township 38, range 19, and township 33, range 21, west of the second meridian, township 42, range 2, west of the third meridian, township 43, range 1, township 45, range 2, township 44, range 5, and township 41, range 9, west of the fourth meridian. To the latter class belonged the surveys made in township 6, range 9, west of the principal meridian, township 38, range 19, west of the second meridian, and township 36, range 2, west of the third meridian.

In township 6, range 9, west of the principal meridian a lake was found to have almost completely dried up which at the time of the original survey had contained about 400 acres. Upon the completion of a drainage ditch which was in the process of construction at the time of our survey, the remainder would soon be rendered totally dry and fit for agricultural purposes.

Retracements were made in township 8, range 31, west of the principal meridian, and township 34, range 3, west of the third meridian. In the former over fifty-two miles of line were retraced.

Some monuments were corrected in townships 5 and 25, range 29, west of the principal meridian, and township 43, range 4, west of the fourth meridian.

An investigation of duplicate monuments was made in township 39, range 1, west of the third meridian, and of lost monuments in township 49, range 20, west of the fourth meridian. It was while engaged on this latter work that cold weather and deep snow came effectually concealing any remains of lost monuments there may have been here and forcing us to close the season's operations. In township 5, range 7, west of the second meridian, the east boundary of section 34 had been omitted from the original survey. This was run and the quarter section monument established.

In township 52, range 20, west of the fourth meridian, an original survey was made. This township was formerly all included in the Cooking Lake forest reserve, but recently the southwest portion was withdrawn; this part was subdivided. Almost all of the part surveyed had been squatted upon. One man had cleared and cropped as much as thirty-five acres in the last three years and had erected a very comfortable two-storey house as well as stables and drive shed. This township is about thirty miles easterly from Edmonton on the Grand Trunk Pacific railway and is becoming increasingly popular as a summer resort for the residents of that city. In Cooking lake itself, there is good fishing and the region is also well suited for duck and partridge shooting.

In township 36, range 6, west of the third meridian, three islands in the immediate vicinity of the city of Saskatoon which had not previously been surveyed, were traversed. The largest of these islands was wanted by the city of Saskatoon for park purposes.



## APPENDIX No. 41.

## ABSTRACT OF THE REPORT OF C. RINFRET, D. L. S.

## MISCELLANEOUS RESURVEYS IN SOUTHERN SASKATCHEWAN AND ALBERTA.

Having organized my party at Moosejaw I left that place on May 6, 1911, for the scene of my first survey work. This consisted of the retracement of townships 16, ranges 21, 22, 23 and 24, west of the second meridian.

These four townships are situated in the best grain growing district in southern Saskatchewan, and are very well settled, only a few railroad sections being uncultivated. The main line of the Canadian Pacific railway runs through townships 16, ranges 23 and 24, and very close to the other two townships. Lack of good water is the greatest drawback, it being impossible to obtain water in some cases even by drilling hundreds of feet.

I next retraced townships 17, ranges 18, 17 and 16, west of the second meridian, in the order named. The land in ranges 18 and 17 is sandy and undulating, and generally second-class, while that in range 16 is very good, although partly covered by brush and sloughs. Very little of the later township is under cultivation but all the even-numbered sections are taken up.

After resurveying nine miles in township 19, range 17, I moved to township 15, range 23, which I resurveyed. This township has good soil and is well settled. Water can be easily obtained from Moosejaw creek which crosses the township, and a branch of the Canadian Pacific railway runs through the town of Drinkwater situated in the northern part.

A retracement was then made of township 16, range 26, in which the city of Moosejaw is located, and a few miles of retracement was performed in townships 17 and 18, ranges 25 and 26, and township 18, range 27, west of the second meridian.

A start was made for townships 14 and 15, range 28, west of the third meridian. In this district the surface is rolling with a sandy loam soil which gets heavier in the northern part. The south third of township 14 is composed of worthless quicksand, and although half of the township is taken up only a small portion is cultivated.

I finished the survey of these townships on August 29 and moved to township 26, range 16, west of the fourth meridian, going via Bassano, a village of about five hundred inhabitants. This place has grown up within the last two years since the Canadian Pacific railway have constructed a large dam on Bow river for irrigation purposes about three miles to the southwest. About two-thirds of this township is fairly level and the soil is good.

The southwest part, across which Red Deer river flows in a valley four hundred feet deep, is cut up by coulees which render it useless for farming. After traversing a lake in township 28, range 15, I left for township 26, range 9, west of the third meridian, which I resurveyed. This township is in one of the best grain growing districts, and was the only place visited where the crops did not suffer from frost. Although over fifty miles from any railroad it is being settled rapidly. Wood is still used as fuel but the supply is limited.

After surveying nineteen miles in township 22, range 6, west of the third meridian, I returned to township 16, range 25, west of the second meridian, and made an investigation for duplicate monuments. I continued the investigation in townships 14, 15 and 16, range 24.

A heavy fall of snow followed by extremely cold weather forced me to abandon work in township 14, range 24. I accordingly stored the outfit at Moosejaw and left



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for Kamsack. With my assistant and one man I surveyed parts of township 29, range 31, and townships 32, ranges 32 and 33. I also traversed a portion of Assiniboine river.

After surveying one mile in township 25, range 29, and traversing Shillingthorpe lake in township 26, range 31, west of the principal meridian, I made an investigation survey in township 30, range 14, west of the second meridian, after which I closed operations for the season.



## APPENDIX No. 42.

## ABSTRACT OF THE REPORT OF E. W. ROBINSON, D.L.S.

## SURVEY OF PART OF THE SECOND MERIDIAN.

The northeast corner of township 61 on the second meridian, which was the starting point of my survey, was reached on July 25, 1911, the party having travelled from Le Pas by steamer to the mouth of Sturgeon river, and from there by canoe to the meridian.

Nomeau lake is a fine body of water connected by English and Whitey narrows with Cumberland lake. The shores are mostly well timbered with spruce, tamarack, jackpine and poplar up to ten inches in diameter. It is well stocked with fish, the principal varieties being lake-trout, whitefish, jackfish and pickerel.

Sturgeon river throughout its entire length from Amisk lake to its outlet at Nomeau lake is treacherous for canoe travel, as the current is swift and there are numerous rapids. A large quantity of freight for the North passes by this route and at certain stages of the water it is possible to run the whole length in York boats. There is a narrow strip of good land on each side of this river varying from five to thirty chains in width, suitable for agriculture. The soil is a sandy loam with spruce, tamarack and poplar up to eight inches growing thereon. On July 26 I commenced work on the second meridian in township 62. There is some good spruce here up to twenty-two inches, with tamarack, jackpine, poplar and birch up to eight inches. The soil is a sandy loam with considerable rock in places. The high land extends to the west about two miles and then drops suddenly into the extensive muskegs which lie to the south of Amisk lake. Sturgeon river was crossed in section 13, and on the north side of the river the line soon entered an extensive muskeg. Small spruce and tamarack cover the whole area, and narrow ridges, three or four feet higher than the surrounding muskeg, are found at intervals. These ridges carry spruce, tamarack and jackpine up to eight inches. Most of the muskeg has a hardpan or rock bottom, and very few are of the floating variety. It is worthy of note that in digging the pits for the monuments at corners, frost and ice was usually encountered at a depth of ten or twelve inches. The maximum daily temperature at this time was about 75° or 80° Fahr., but the upper layer of dry moss on the muskegs acts as a very efficient non-conductor of heat. The nights were invariably cool as one would expect and summer frosts were of common occurrence. If the muskegs were drained and cultivated, and I am of the opinion that they could be made into excellent hay land, the soil would absorb heat during the day, and this being radiated gradually throughout the night, would overcome these summer frosts. About the centre of section 1, in township 63, the line enters a stony ridge well timbered with jackpine, poplar, spruce and tamarack up to ten inches in diameter. Small patches of swamp are distributed throughout. This ridge extends to the shore of Mari lake and lies generally to the southeast of this lake. A fair amount of pulp-wood could be obtained here and some logs are large enough for milling purposes. Mari lake is about seven miles long and from one and a half to three miles in width. Its waters are well stocked with mari from which it obtains its name, whitefish, jackfish and pickerel. From the lake there is a water route leading from the southwestern corner to Amisk lake, and from a bay in the east side to Athapapuskow lake, or Papuskow lake as it is sometimes called. A water route does not necessarily mean direct water connection but oftentimes a string of lakes connected by portages. North of Mari lake the country becomes higher, while rocky and sandy ridges are the common features and these



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are covered with small poplar, jackpine, spruce, tamarack and some willow. These ridges are from fifty to two hundred and fifty feet high, the approach sometimes being gradual, but oftentimes a precipitous rock bluff. Muskegs and swamps have a rich black muck soil and clay subsoil, and small lakes occur between the ridges. In townships 64 and 65 the limestone formation changes to granite, and several discoveries of mineral have been reported on the contract between these two formations, iron pyrites being seen at several points. The granite is seamed with small veins of quartz and quartzite, and 'iron cappings,' which are considered to be sometimes an indication of mineral, are common. In section 12, township 65, we crossed Sucker creek which flows into Amisk lake. This is a main route of travel to the east and northeast. The country continues of the same description except that the lakes have rocky shores. No timber of milling size was found with the exception of odd trees, but there is a large quantity of spruce up to eight inches in diameter suitable for pulp-wood. Mixed with the spruce there is jackpine, tamarack, poplar and birch averaging from six to eight inches. Echo lake was crossed in section 25, township 65. North of Echo lake the rock ridges become more broken, but the country is generally of the same description. The multitude of small lakes in this country is worthy of notice. It was difficult to map all the lakes even close to the line, and east and west they seemed as numerous. From the top of any rocky ridge it was the ordinary experience to be able to see three or four small lakes. In section 1, township 67, a change occurred in the timber, and we entered *brulé* country. The fire happened about twenty-five years ago and covered a very extensive area. It took place during a very dry season and not only destroyed the timber, but burnt what little soil there was on the ridges. Small jackpine, spruce, and birch are now growing up. In section 25, township 67 we crossed a creek about seventy feet wide which I believed to be the one that I heard ran into Wildnest lake. It was explored for some distance but the lake was not found. Our provisions were now very short so I determined to discover this lake if possible. I left camp with my explorer and we travelled to the northwest and north for three days. Many lakes were found, some large and some small, but we were compelled to turn back without finding Wildnest lake, as I knew that by this time the provisions in camp, even on short rations, were barely sufficient to take us back to Amisk lake where I had a small cache. On October 7 I therefore started back. Trying to find a shorter route to Amisk lake I came across a strip of fine spruce approximately in section 23, township 66, range 1. The trees ran from twenty-four inches to thirty inches in diameter; the belt was about thirty chains in width where it was crossed and in length it seemed to extend for a considerable distance. We reached the cache on Amisk lake during the afternoon of the 8th, where I had left enough provisions to take the party to Le Pas. It was a sad disappointment to hungry men to find that the cache has been robbed and that all the meat, sugar, jam and baking powder had disappeared. Fortunately some flour, beans, and a little butter was left. I was now compelled to send to Wildnest lake for some provisions by the Sturgeon Weir river route—a long and arduous trip. I therefore despatched six men with my assistant in charge and they made the round trip in eight days, arriving back on October 16. The weather was very stormy and I hesitated to risk canoes on Amisk lake. However on the 18th we made a start and arrived at the mouth of Tearing river on Cumberland lake on the 23rd. The weather was now cold, some snow had fallen and the shallow bays were freezing at nights. I accordingly left my camp and outfit at Tearing river and on the morning of the 24th left by canoe for Le Pas. I travelled by the Tearing river and found that this passed through a low swammy country. The banks are lined with grey willow, cottonwood and some water-birch. There was considerable water in this river and only two short rapids. I heard subsequently that the steamboat is able to use this channel in high water. I arrived at Le Pas during the afternoon of the 25th and commenced arranging my outfit for the winter's work on the fifteenth base line. Winter had now set



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in and the marshes, swamps and small lakes were frozen. Saskatchewan river was carrying slush ice, but it was November before it was frozen across.

During this season's work we did not see any large quantity of land immediately available for agriculture. Most of the swamps and muskegs if drained would make excellent hay land and some root crops would do well. The climate was on the whole favourable with plenty of sunshine, and although summer frosts were experienced these I believe could be overcome through cultivation. At Cumberland House on Cumberland lake all vegetables do well, and the fact that tomatoes are raised successfully year after year is sufficient evidence as to the climate. The winters are similar to those of Manitoba but with a heavier fall of snow—from two to three feet being the usual quantity. Through most of the district traversed we found spruce and poplar suitable for pulpwood, with larger milling spruce close to Amisk lake. Fish are plentiful in all lakes except the small marshy ones. Amisk lake in particular has the reputation of supplying the largest and finest whitefish in this section of the country, and also has in its waters jackfish, pickerel and lake-trout. Cumberland lake is rapidly filling up with the sediment brought down by Saskatchewan river and here the fishing is poor. Jackfish and goldeye are the most common varieties obtained and at certain seasons even these are scarce.

## SURVEY OF PART OF THE FIFTEENTH BASE LINE WEST OF THE SECOND MERIDIAN.

On November 23 I left Le Pas for the survey of the fifteenth base line, travelling by the Cut Off and Saskeram lake to Tearing river where I camped. At this date winter had well started. The rivers and lakes had frozen over and about fourteen inches of snow covered the ground.

I experienced considerable difficulty when organizing my party at Le Pas in obtaining a sufficient number of dog teams. There has been a great demand for dogs during the last few years by survey parties locating the Hudson Bay railway, and they are accordingly scarce and of inferior quality.

I commenced work on November 29 at the northeast corner of section 36, township 56, range 1, west of the second meridian, which falls in one of the large willow marshes so characteristic of Saskatchewan river valley. On the west side of this marsh is a good belt of spruce, jackpine, tamarack, poplar and birch, averaging twelve inches with occasional spruce up to sixteen inches in diameter. Small swamps and patches of *brulé* are found throughout this area. The base line crosses Tearing river in section 33. This river varies from five to thirty chains in width and in places has many channels separated by islands. It is an outlet from Cumberland lake to Saskatchewan river and runs through a low marshy country, which within comparatively recent years was a bay of Cumberland lake. At present Tearing river carries a considerable quantity of Saskatchewan river water which will be explained more fully subsequently in this report.

West of Tearing river the base line continues through a marshy country, until in section 35, township 56, range 2, it enters the fringe of timber along the old channel of Saskatchewan river. This belt runs from five to fifty chains in width and consists of large cottonwood with some good spruce, poplar, birch and elm. I made an attempt here to connect the Cumberland Indian reserve to the base line, but found that the boundary lines of the reserve ran through marshes, and with the snow on the ground it was impossible to definitely locate the lines and corner posts. I made enquiries on the reserve and no one seemed to know the exact location of the corners, but I was informed that in the summer-time a post, or the remains of one, could probably be shown me. As I had already delayed my party I considered it advisable to postpone this work until next summer when I would be passing this point. On the west side of the channel the line crosses a similar belt of timber and then emerges into the extensive area of willow swamps, hay meadows and shallow lakes which lie to the south of Saskatchewan river. Large numbers of muskrats are to be found in these



swamps and it is a famous rat-hunting ground for the Cumberland Indians. The base line continues in these swamps through ranges 2, 3, and 4. In range 5 a few ridges of higher land were encountered with spruce, tamarack, birch, poplar and cottonwood growing thereon. These ridges are separated by large willow marshes. The old channel of Saskatchewan river was crossed again in range 6 and on the west side some excellent spruce and tamarack was found. The spruce ran up to twenty inches in diameter and the tamarack to eighteen inches. There is also considerable tie timber and pulp-wood there. One lake and several marshes divide this timber belt into different sections. To the north of this belt lies an extensive area of swamps and shallow lakes through which run several old channels of Saskatchewan river.

At the commencement of range 8 we crossed Torch river which is now the main channel of Saskatchewan river. Some years ago during a season of very high water Saskatchewan river broke through its left bank in section 2, township 56, range 8, now known as the 'Cut Off,' and, cutting a channel into Torch river, found its way into Cumberland lake. A sand bar formed across the original channel and now only during high water can this old channel be used for navigation. In fact from August of each year there is barely enough water for canoe travel. For the first few years after the river changed its course it took a channel through townships 57, ranges 7 and 6, into a long bay at Cumberland lake. Owing to the current being checked by meeting the water of Cumberland lake the matter held in suspension, and Saskatchewan river in flood time carries an enormous quantity, was deposited, and rapidly filled up this bay; consequently the river was forced to seek new outlets to Cumberland lake. Many new channels were formed but were quickly filled in. A few years ago a channel was cut entering Cumberland lake at Pine Bluff, and at present the bulk of the Saskatchewan water flows this way. The water from Cumberland lake has two outlets into the original Saskatchewan channel, viz. Big Stone and Tearing rivers. Both these rivers have rapids in their course but are navigable most of the summer season for small steamboats. About twenty-five years ago a bay of Cumberland lake stretched to the southeast along the present course of Tearing river. This is now filled in and Tearing river pursues a tortuous course through swamp lands and hay meadows. During the season of extreme high water the whole of this section of the country, with the exception of a few high points, is flooded. A considerable quantity of suspended matter is deposited during each of these floods and many shallow lakes have been first marshes and then hay meadows within the lifetime of some local residents. The soil is a rich black muck on a hardpan or rock bottom. If the summer floods of Saskatchewan river were controlled and drainage of a comprehensive nature undertaken, a considerable area of country, now the abode of the muskrat and bittern, would become available for settlement.

The base line was continued through range 8 and Torch river was again crossed. The banks are well timbered with spruce up to fourteen inches in diameter, cottonwood and tamarack to eighteen inches and white poplar and birch. South of Torch river the country is swampy with the exception of one ridge carrying spruce, tamarack and poplar. There is also a well-defined ridge of the same class of timber stretching to the north. I had a cache of supplies established on this river last summer and the line passed within ten chains of it. The success of this winter's work is largely due to the fortunate placing of this cache. To prevent delay in base line work it is essential that a cache be established ahead on the line and when a surveyor is fortunate enough to have one well placed he realizes how it assists the work.

Torch river was again crossed in range 9. South of the line lies an extensive spruce and tamarack muskeg. Along the river the fringe of spruce, tamarack and poplar continues and the soil is an excellent sandy loam. There is a nice strip of spruce up to ten inches in diameter lying along a small creek entering Torch river from the north in section 11. To the north the country is generally a spruce and tamarack muskeg with bluffs of spruce and tamarack up to eight inches on the higher land. At the commencement of range 10 a tributary of Torch river was crossed and



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along both banks was found some excellent spruce, tamarack and white poplar up to fourteen inches in diameter. The timber is clean and well suited for ties.

This creek averages about one hundred and fifty feet in width and apparently has a swift current with many rapids. From an examination of the timber along the bank there is evidently a large volume of water flowing when the stream is in flood. West of this creek it is spruce and tamarack muskeg, with narrow ridges covered with jackpine, tamarack and spruce up to eight inches in diameter. Most of the muskeg is what is known as 'dry' muskeg, but there are some open swamps. The trees are very stunted on these muskegs and evidently have a hard struggle to survive. One spruce tree two and one-half inches in diameter was examined and its annular rings showed it to be one hundred and twenty years old. This kind of country continues through ranges 10 and 11, and for a considerable distance north and south of the base line. In section 31, range 12, a creek was crossed which proved on exploration to be the same one that was crossed in range 10. There was still some fine timber about its banks, the principal varieties being spruce, tamarack and cottonwood from eight to fourteen inches in diameter.

Passing into range 13 the line again enters spruce and tamarack muskegs while to the south of the base lies a large open swamp. The spruce and tamarack muskeg continues to the north and is crossed by sandy ridges carrying jackpine and spruce up to eighteen inches in diameter. Proceeding westerly through range 14, the country rises somewhat and the ridges become more prominent. South of the line is an area of spruce from six to eight inches in diameter suitable for pulpwood. Jackpine and spruce up to eight inches were found on the ridges. Between the ridges there was the customary spruce and tamarack muskeg with patches of open swamp. A well-defined ridge of small jackpine was crossed at the commencement of range 15, and west of this a large open muskeg about seven miles long by three miles wide.

Farther west again the country rises and the ridges, covered with jackpine and spruce averaging six inches in diameter, are more pronounced. Between the ridges tamarack and spruce muskegs are found. To the southwest could be seen a range of hills trending in a northwesterly direction.

Through range 16 the low sandy ridges continue, becoming higher toward the western part of the range. Small jackpine cover the summits of the ranges with small spruce, tamarack, and some poplar and birch on the slopes. The usual muskegs and swamps are found between the ridges. In the eastern part of range 17 the base line crosses a well-defined range of sand hills covered with small jackpine. South of the base line the hills have a general trend to the southeast. To the north of the base line they run to the northwest for about three miles and then turn due north for about nine miles, where a range of hills from the west joins. They are partially timbered with small jackpine, large patches of snow showing up prominently from a distance. The lower slopes of these hills have small jackpine, spruce, tamarack, poplar and birch. In section 33 a small creek was crossed and to the west of this the country again rises into rolling, sandy, jackpine ridges. In section 31 two small creeks were crossed which join, and flowing a little to the east of south enter White Gull creek, which empties into Torch river. In section 35, range 18, the base line crosses the located line of the Hudson Bay Pacific railway, which commences at Prince Albert. This line follows a well-defined ridge timbered with small jackpine, spruce, tamarack, poplar and birch. A fire ran through this section of the country a few years ago and destroyed some good jackpine, spruce and tamarack. The soil is generally a light sandy loam with some areas of good clay loam in the lower places. If this railway line is constructed, some good agricultural land will be available for settlement along this ridge. At present the only means of access is by a wagon road leading from Fort a la Corne. This road crosses the base line in section 33, range 18, and passes to the south through a rolling sand-ridge country with *brulé*, windfall and second-growth jackpine. The *brulé*



country continues through range 19 with small jackpine, spruce and poplar now growing up. The soil is a light sandy loam with some patches of heavier soil. In section 34 we crossed White Gull creek which flows to the southeast emptying into Torch river. A range of hills shows up prominently to the north, distant about ten miles, and extensive muskegs lie along the base of these hills. In range 20 more muskegs are found with scattered small spruce and tamarack. White Gull creek runs to the north of the base line and with its tributaries drains the area between the line and the range of hills to the north. Entering range 21 the land becomes somewhat drier, especially to the south, the rolling sand-hills so characteristic of this section of the country being noticed. North of the line is White Gull lake, a body of water about six miles long by two miles wide. The southern shore is marshy, but the northern shore is somewhat bolder. To the north of the lake is a range of low hills, carrying some fair spruce and poplar up to ten inches in diameter. There is a trail about six miles long running between Candle and White Gull lakes. In summer, however, travel over it is difficult owing to the many muskegs crossed. This trail intersects another one which runs from Candle lake north to White Swan lake. On March 13, having completed range 21, I decided to cease work for the season. The weather had turned warm, the snow had gone from the south side of some of the ridges and transportation was accordingly difficult.

I brought the outfit out by following the White Gull trail to Candle lake and thence across Candle lake to the fish camp on the west side. The trail then crosses the narrow strip of land between Candle lake and Little Candle lake and follows the east shore of the latter lake to its southeastern corner. From this point an excellent wagon road runs to Prince Albert. Some good spruce, poplar, tamarack and birch were found along the road until we neared Fox plains where the country has been burnt. There we passed the first settlement and the homesteaders reported that they expected an influx of new settlers in the spring when there would be a demand for homesteads farther north along this road. During the summer time this road is sometimes difficult to travel owing to wet places. We reached Prince Albert on March 17, and from there proceeded to Le Pas where I disbanded the party.

Generally speaking the timber in the section of the country traversed by this base line is not large enough for milling purposes. The eastern part of the base line runs through a swampy and muskeg country, comparatively little land being dry enough to support timber of any size. In township 57, range 1 is a scattered belt of spruce up to sixteen inches with jackpine, tamarack, poplar and birch. Along both banks of Saskatchewan river one finds spruce, poplar, tamarack, cottonwood, birch and elm. This strip varies from a few chains to fifty chains in width and there are many places where logging could be profitably conducted, although the patches of merchantable timber are small. In range 7 we crossed an area of first-class spruce and tamarack, the timber being clean and sound. Along Torch river in range 9, and its tributary in range 10, we found spruce, tamarack and poplar from ten to fourteen inches. Much of this timber would be suitable for ties, and Torch river could be used to drive them down to Saskatchewan river. The tributary of Torch river was again crossed in range 12, and similar timber was found along its banks. There are, however, many rapids on this creek and driving would be difficult. This was the last timber we crossed of immediate market value. On some of the ridges farther west there are small areas of spruce suitable for pulp-wood and some tamarack of small size.

The fishing in Cumberland lake is yearly becoming of less importance owing to the lake filling up. The other lakes passed are all too shallow for fish, except White Gull lake in ranges 21 and 22, which is reported to be well stocked with jackfish and pickerel. Game is plentiful, moose and caribou being found in considerable numbers. Fur-bearing animals are fairly numerous, the principal varieties being marten and lynx.



## APPENDIX No. 43

## ABSTRACT OF THE REPORT OF O. ROLFSON, D.L.S.

## SURVEY OF THE TWENTY-SECOND BASE LINE ACROSS THE PEACE RIVER BLOCK.

I left Edmonton on March 2 and travelling via Athabaska Landing, Grouard and Peace River Crossing, reached Dunvegan on the 25th. Sleighing was good all the way except along the prairie south of Peace River Crossing, where the snow was fast disappearing. The ice was followed from Athabaska Landing to Grouard (except for ten miles east of Sawridge) and also from Peace River Crossing to Dunvegan.

As the ice above Dunvegan was considered unsafe, one of our freighters having broken through, we decided to follow the trail leading to Fort Grahame. This trail, cut by the Royal Northwest Mounted Police during the Klondike 'rush,' leaves the overland route from Peace River Crossing to Dunvegan at a point about ten miles north of the latter place, and, going north and west, leads to Island lake where there is an Indian settlement. From here the trail runs northwesterly through beaver meadows, scrubby prairies and poplar bluffs to a large prairie on the east side of Clear river. This prairie, over three hundred acres in extent, is surrounded by poplar and spruce, with a lake at the south side.

After crossing Clear river the trail turns southwesterly crossing several streams with valleys three hundred feet deep and passing through spruce and jackpine woods till Boundary lake is reached. This lake is about one mile wide and two miles long with grassy shores along which a great amount of medium quality hay could be cut. The trail runs west from Boundary lake through spruce, poplar, jackpine and open prairie, crossing North Pine river at the mouth of Fish creek. During low water the river is about two feet deep, but at high water a man must swim his horses and raft his supplies from the upper ford about two miles up the stream. The valley is over six hundred feet deep and the grades are very steep. South of the valley of Fish creek the country is level and after travelling ten miles through light poplar and open prairie, Fort St. John, lying at the foot of the hills on the north side of Peace river, is reached.

From Fort St. John to Fort Grahame the trail, which is not much better than a widely cut pack-trail, is much rougher and crosses numerous deep valleys. The bridges across the streams are in bad repair and many of the grades are washed away.

We reached Boundary lake on April 27, and after building a cache we commenced our work from the northeast corner of township 84, range 13, west of the sixth meridian, as established by Mr. J. R. Akins, D.L.S. We ran the east boundary of townships 84 and 83, in range 13, and the jog on the correction line to the line run from the south, thus forming the tie between the twenty-first and twenty-second base lines.

This east boundary almost immediately runs into a spruce and tamarack swamp, extending for over two miles, then through heavy windfall and standing dead timber grown up with young poplar and jackpine. With the exception of one or two small areas which have been burned oftener and are now grown over with poplar, this continues as far south as the correction line. All along the jog the timber is mostly poplar, the country undulating and well watered by good fresh-water streams.

After completing the meridian we moved north and commenced work on the twenty-second base line which we completed on October 13.

This line through ranges 13, 14, 15, 16, and 17, passes through undulating country, the surface of which is covered with spruce, jackpine and poplar with



occasional openings of scrubby prairie. This scrubby prairie and light poplar country is the result of fires destroying the original timber. The soil is a good clay loam with grass, wild vetch and pea-vine.

North Pine river is crossed in section 36 of range 18. At low water this river is two hundred feet wide and about two feet deep, but at high water it is three hundred feet wide and more than eight feet deep with a current of four miles per hour. The valley is over six hundred feet in depth and averages one mile across. Sandstone of good quality was noted in the cut banks of this river.

Through ranges 18 and 19 the country is rolling and the timber is almost all poplar with willow scrub. A large prairie lies to the north of the line and much of the country south as far as Peace river is scrubby prairie.

Charlie lake, crossed in the western two miles of range 19, extends for about seven miles northwesterly and southeasterly. It is drained from the south by Fish creek which runs into North Pine river.

In range 20 the line passes through a belt of good heavy spruce with a few strips of poplar, many of the trees being three feet in diameter and perfectly sound. With the exception of a few small areas of poplar and jackpine this belt extends about one mile south and eight miles north of the line. The timber moreover could be marketed without great expense as it could be rafted to Peace river via Charlie lake, Fish creek and North Pine river.

The country is hilly and well watered by fresh streams, while the soil is black loam and clay. From the hills west of Charlie lake one can see the mountains in the distance.

Through range 21 and the east half of range 22 the country is still hilly but the timber is poplar and scrub with an occasional small belt of spruce. The soil is clay and clay loam and the underlying rock appears to be limestone.

Through the middle of range 22 flows Cache creek while just beyond the west boundary of the range is its west branch. Between these two streams is a level stretch of country extending to the streams themselves while the country to the north is hilly. Part of the surface is prairie and the rest is covered with poplar.

The country through range 23 is rolling, the surface being covered with small *brulé*, spruce and tamarack swamps and small strips of jackpine and poplar. The soil near the line is very sandy but a good area of farming land lies about six miles to the north.

Halfway river flows southerly through the middle of section 31 in range 23, in a valley five hundred feet in depth and varying from a half mile to a mile in width. At low water the stream is about three hundred feet wide and four feet deep with a current of five miles per hour, but in some places the river narrows to straight rock walls with a very swift current while in others it has wide gravel bars strewn with driftwood and even whole trees. At high water it is over a quarter of a mile wide in places and at least ten feet deep in midstream.

From the valley of the river to the west boundary of the block the country is mostly undulating and the surface is covered with jackpine, spruce, poplar, willow, alder, and spruce and tamarack swamps while the creeks are few until nearing the west boundary. About six miles south of the line in range 24 there is an area of about forty square miles of good farming land in which the soil is clay and clay loam.

About one mile south of the line in the middle of range 24 and turning abruptly south into Peace river a stream about forty feet wide and one foot deep flows through a valley three-quarters of a mile across and nearly three hundred feet in depth.

Grayling are found in North Pine river, grayling, speckled trout and pike in Halfway river, and rainbow trout in the stream running through range 24. In the spring ducks, geese, partridges and prairie-chickens are plentiful, while rabbits are numerous at all times. Black bears and moose are seen occasionally. Most of the fur-bearing animals and large game, however, are exterminated, so that the Indians now go north nearly to Fort Nelson river for their winter's hunt.



## SESSIONAL PAPER No. 25b

Potatoes, carrots, beets, cabbage, parsnips and lettuce of excellent quality are raised at Fort St. John, and one settler there states that in addition to the above he has ripened tomatoes, rhubarb, squash and on one occasion watermelons. Wheat has never been tried here, but we were informed that as a general rule there is no serious frost in the valley before October, although along the line frost was noted on July 13, 20, 21 and 23, and on August 8.

Fort St. John is situated on the north side of Peace river about five miles above the mouth of Pine river. The Hudson's Bay company, and Revillon Bros., each have a post here, and the British Columbia agent has his office on the south side of the river. The Hudson Bay company's steamer makes three trips a year between St. John and Fort Vermillion.

We commenced our return trip on October 16 arriving at Fort St. John on the 23rd.

While crossing Halfway river one of our men was accidentally drowned and although the party searched for two days no trace of his body could be found.

The pack-trail from St. John to Tremblay's ranch on Pouce Coupé prairie is good, the country being well watered and feed excellent. As well as one can judge from travelling a pack-trail this prairie will make good farm land, and when Grande Prairie district is settled this appears to be the natural direction for newcomers to move and make their homes. A wagon road to Fort St. John can be built with but little work except at the crossing of Little Kiskatinaw and Pine rivers.



## APPENDIX No. 44.

## ABSTRACT OF THE REPORT OF A. SAINT CYR, D.L.S.

## SURVEY OF PART OF THE SEVENTEENTH BASE LINE FROM BEAVER RIVER WEST TO THE FOURTH MERIDIAN.

Before continuing the production of the seventeenth base line from the point where we ceased operations in the fall of 1910, I proceeded to township 57 on the third meridian and from the point where the road to Montreal lake crosses the meridian in section 13 I made a traverse survey of the lake, in order that its position might be shown correctly on the maps.

Having completed this work I returned to Prince Albert, and on March 22, 1911, set out for the initial point of my survey of the base line, west of Beaver river.

I followed the winter road from Green Lake to Cowan river and then travelled over the ice on this stream and Beaver river to Rat creek, where the winter road ascends to the top of the benches rising west of Beaver river.

In that distance there are some rapids and I had been informed that the ice had already given way in places. It was feared that, if the mild weather with which we had lately been favoured, continued, the water would rise in Cowan river breaking the thin ice over the rapids and making it difficult for us to reach the base line.

As it was urgent that all our outfit, supplies and a large amount of horse feed should be brought west of Beaver river before the general break up came, I hired additional help at Green Lake settlement.

On March 31, having finished all my business at Green Lake, and after making arrangements to have mail brought to my camp at intervals during the season, I left for the seventeenth base line.

The road we followed in returning to the base line is part of the road travelled in the winter by the mail carrier and also the freighters going to the settlements and the fur-trading posts at Lac la Plonge and Ile a la Crosse. It is a long and circuitous route and has, besides, serious drawbacks.

Two years ago companies were formed to develop the fish industry in the northern part of this province and the winter traffic created by this new industry which must pass over this road, added to the transportation of the large amount of goods required by the fur-trading companies in provisioning their posts and the northern settlements, has led all the parties whose trade interests call them into this northern country to seriously consider the advisability of continuing northwards beyond Doré lake the new road opened last winter to this place.

It would give a continuous overland route which they claim would also be much shorter than the one followed at present.

My transport outfit consisted of ten flat sleds which had been made broader than usual in this country. These can be used to advantage over fairly level country or on well beaten roads, when a pony will haul loads averaging five hundred pounds. For the transportation of the horse feed and the baggage of the party, I took the double sleds which I had used on my two previous winter surveys. On March 31 the survey of the seventeenth base line was resumed at the northeast corner of section 35, township 64, range 13, west of the third meridian.

It progressed rapidly across ranges 13, 14, 15 and 16, where many large open swamps are intersected by the line. Being still frozen they afford the best route for moving the outfit between camps, and on the lakes the ice remained firm enough to carry teams till the end of April, or long after the snow had disappeared. By that



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time we had come to the high land north of Waterhen lake. The only obstacle met with, west of Beaver river, was the crossing of Waterhen river, near range 15; hence large rafts were built and were used for ferrying our outfit.

The ponies also had to be transported on these rafts to the opposite side of the river as the water was not deep enough to allow them to swim and the bottom is too soft and treacherous to risk taking horses across this stream, which for several miles on both sides of the base line is quite wide. During the summer the survey went on without interruption, the country gradually improving for travelling as we moved westward. By July 24 the line had been completed to the east shore of Cold lake in section 32, township 64, range 25.

From the northeast corner of this section a tie was made on the fourth meridian north of Cold lake by surveying the east boundaries of sections 5, 8, 18, 19, and the north boundaries of sections 8 and 19 in township 65, range 26. Thence the line was produced across fractional township 65, range 27, to the fourth meridian, where it struck two chains and thirty-two links south of the northeast corner of section 24, range 1.

On August 9 the survey of the seventeenth base line and the levels along this line had all been completed to the fourth meridian.

DESCRIPTION OF THE COUNTRY ADJOINING THE SEVENTEENTH BASE LINE, FROM RANGE  
THIRTEEN TO THE FOURTH MERIDIAN.

West of Beaver river which, from its confluence with the outlet of Green lake, flows across range 12, is a strip of nearly level country with many open swamps, a few of which, when drained, could be converted into profitable hay meadows.

The soil on the higher lands, which are at present wooded with poplar and birch, is good. At intervals are found ridges where jackpine grows. These ridges are more frequently met in the southern half of township 64 in the vicinity of Beatty creek, a small tributary to Beaver river, which it joins seven miles south of the base line.

Travelling westward across ranges 13 and 14, several large lakes are passed, which drain into Waterhen river, four miles north of the base line. This stream leaves Waterhen lake near the northeast corner of township 63, range 16, and flows northeasterly to the east outline of range 14, thence its course is due east for seven miles where it joins Beaver river.

Many rapids are encountered on Waterhen river in that distance of twenty-five miles, and though the Indians who ascend this stream in canoes have made artificial channels by removing the worst obstacles, they sometimes upset their loads in going through these intricate places.

Waterhen river is 100 yards wide, in its widest part, and at seventeen miles from its mouth receives a large creek which comes from the north through range 15. The Indians report that they can ascend this stream in their canoes a distance of eighteen or twenty miles.

This stream is intersected by the line three-quarters of a mile from its mouth. Along it the country is fairly open and although the land is stony in many places the soil is good and wild hay, pea-vine and vetch grow on the prairie patches found at intervals in the valley.

The aspect of the valley of Waterhen river varies greatly. It is widest for four miles below Waterhen lake but, farther down, the benches at intervals approach to the river banks, their steep slopes reaching down to the water's edge.

In such places there are rapids separated by stretches of comparatively slack water confined by low swampy meadow lands. Similar meadow lands are found also near the mouth of Waterhen river, and extending back three or four miles to the first rapids. The wild hay which grows in this vicinity is of good quality and is found partly on the flats along each bank of the river, but mostly on certain islands. For, a short distance below the last rapids, the river divides into many channels.



A larger quantity of good hay could be cut here by the Indians if the land was cleared of the clumps of willow dispersed all over these flats. Then instead of using the primitive way of cutting hay with scythes as is their custom, light mowing machines such as are used around the settlements of Green Lake, Island Hill and Meadow Lake could be used to advantage.

At about eight miles up stream from Aubichon's stopping-place more hay meadows are reported to exist. Before reaching these, however, the valley narrows, while from the right bank of the river rises a range of round knolls across which run, through narrow gorges, the drainage of the lakes and wet swamps found west of Beaver river.

As the fall is considerable between Waterhen river and the wet lands, these could easily be drained.

Between the crossing of the river by the line near the northeast corner of township 54, range 15, and Waterhen lake, a few narrow meadows adjoin both banks of the river. At one or two places on the north side, when approaching the old Indian village, these meadows extend inland from a quarter to one mile back from the river, to the foot of the high wooded hills.

At the site of the old Indian village the hills recede from the river and the intervening country is not so broken. It has, moreover, been to a large extent cleared of the heavy timber by repeated fires which have overrun it.

Of this spruce forest there now remains only a block of three square miles which is crossed by the line in sections 35 and 36, range 16. The trees are from ten to thirty-six inches in diameter. Two miles north of this block of timber are lakes, the largest of which covers nearly all of sections 14 and 23 in township 65.

The rolling country to the east is wooded with poplar, birch and scattered spruce. More lakes are found to the northeast where the country becomes low and swampy and where I came to impassable quaking bogs which probably drain into the largest tributary of Waterhen river.

A similar low country is also reported to exist in the west half of township 65, range 15, and to extend far towards the seventeenth correction line.

East of Waterhen lake the country is hilly. Poplar bush extends to the middle of range 15, where low and sometimes very boggy lands lead to a lake lying in the northeastern part of township 63. This low country surrounds the lake to the south and continues far to the east where most of its drainage goes to the Beaver by way of Beatty creek. Many small lakes surrounded by hay meadows are reported along the course of this creek.

A large stream flows out from the east side of the lake in township 63, and turning northwards runs along the foot of pine wooded hills which rise a short distance from the northernmost bay of this lake. It eventually connects with another large lake in section 33, township 64.

The Hudsons' Bay company's trading post at Waterhen lake is built on the east side, on an arm of the lake, which separates it from the Indian village. Across these narrows there is hard bottom and as the water is not over two feet and a half deep in ordinary seasons, the Indians frequently ford this with their ponies.

This trading post is the end of the winter road to Green Lake, which crosses Beaver river a short distance from Island Hill. From the post this road passes through a rolling country wooded mostly with poplar and birch and extending three miles beyond the south shore of Waterhen lake. Thence to Beaver river, the route is over nearly level country with good soil where wild hay grows in profusion.

Two deep bays cut into the north shore of Waterhen lake and from the northeast bay Waterhen river flows. This bay is shallow and the mud banks are covered with tall grass and reeds which are frequented in the summer by countless flocks of the birds from which the lake derives its name. Their eggs are very delicious to eat and are much prized by the Indians on account of their not having the peculiar fishy flavour noticed in the eggs of some other kinds of aquatic birds.



## SESSIONAL PAPER No. 25b

Flotten river flows into the northwest bay which extends past the north boundary of township 63, range 17. It is a rapid stream which carries to Waterhen lake the waters of Flotten lake, a body of water seven miles long and three miles wide. The river being a succession of rapids, cannot very well be used in going from one lake to the other. There is, however, a good portage five miles long, which runs to the east side of the river up to the south end of Flotten lake and thence northwards through the country east of the lake.

The country on both sides of this river and lake has been visited by fires. The surface is quite hilly near the lower reach of the river but has a better appearance near the base line where it is more level, while patches of prairie land are often seen interspersed with poplar bluffs and clumps of spruce.

Some large spruce from ten to twenty-four inches was noticed along the north shore of Waterhen lake east of the mouth of Flotten river, which will cover tracts of from five to ten acres.

The rest of the country adjacent to and north of Waterhen lake is wooded with poplar four to ten inches in diameter. Birch also grows along the lake shore and on most of the hills, while large jackpine ten to twenty inches are also frequently seen.

Flotten lake covers the central part of township 65 and extends to its north boundary. East of the lake are three miles of dry and sparsely wooded land which borders on the large stretch of low country noted across range 16.

North of Flotten lake there is a strip of burnt-over country half a mile in width and north of this is twenty square miles of large spruce timber which it is estimated will yield 30,000,000 feet of lumber.

Two small creeks flow across this forest and discharge into the lake. Two trails lead to this block of timber, one of which starts from the northwest bay of Waterhen lake and goes to the east edge of the heavy timber, and the other begins at the north shore of Flotten lake, going three miles north through heavy timber, then turning northeast and probably joining the other trail.

From range 18 to range 24 the base line passes over a succession of high hills and crosses some wide deep valleys. These valleys lead to a depression which extends west from Waterhen lake to the fourth meridian.

In that depression lie lac des Isles and Pierce lake, which, with their connecting rivers, form a continuous water route between Cold and Waterhen lakes.

Of the many valleys crossed by the line in that distance of forty miles two deserve mention, because through them access may be had to the northern country which otherwise is difficult to reach owing to the large quantities of windfall.

In each of these valleys are well-defined trails indicating that they are frequented by the Indians on their hunting trips. Good pasture is also found along the creeks which wind through these valleys.

The first valley was intersected by our survey in the west half of range 19. Three miles south of the line in the valley there is two hundred acres of large spruce, while smaller areas are reported at intervals farther south. The other valley follows the east outline of range 23, and about midway between the valleys in section 32, range 21, occurs the highest elevation met with on our survey. Both valleys where the line crosses are very deep and are about half a mile wide between the crests of the benches. Towards the south the valleys become gradually wider while their benches get considerably lower.

Very little timber suitable for lumbering is now found in these valleys, the sides of which are wooded mostly with poplar.

The streams which flow in these valleys are fed by numerous springs rising in the hillsides, the water being strongly impregnated with iron. The whole country is covered with second-growth poplar, birch and pine, while the soil consists of clay loam sometimes mixed with gravel and stones. This country is too rough for farming but when cleared of the light woods and scrub which grow in places, it would be



suitable for stock-raising. Grass grows everywhere through the light poplar woods and on the hillsides. Such is the general character of this elevated land.

Through ranges 24 and 25 the land is undulating and not so stony in the vicinity of the line, though a few miles north of the line the country again becomes rough. The hills are covered with deadfall and there are large tracts wooded with jackpine which has been killed by a fire which must have occurred very recently as the dried leaves are still on the trees.

The soil consists of sandy loam six inches deep with a subsoil of clay.

In section 34, township 64, range 24, is a lake surrounded by hay lands north of which, in section 4, grow some large spruce. The line cuts through the south limit of this clump of timber and then through three miles and a half of swampy land.

In section 35, range 25, we crossed an Indian trail in the valley of a creek which flows into Pierce lake, four miles to the south. West of this stream is a strip of large green poplar and beyond this again is a stretch of several miles of fire-killed timber and windfall.

In the summer of 1910 a disastrous fire swept over these dense forest lands. It appears to have closely followed the pine woods which always contain masses of inflammable material, but to have hardly penetrated the poplar woods. The fire appeared to have started about three miles south of the base line in range 25 and fanned by the high winds to have spread in a generally northwesterly direction to the valley of Primrose river. There its progress does not seem to have been checked to any extent, as recently burnt-over areas were seen west of that stream. These forest fires are hard to account for. Indians seldom visit the country and they always carefully put out their camp fires, even going to the trouble of banking them with clay. These Indians seem to understand pretty well too that it is in their interest to preserve the forests which are the haunts of game on which they mostly subsist. After each fire moose and deer will leave the country and will not return for several years. I believe that some of the forest fires are caused by lightning, for, many times after an electrical storm which is always followed by high winds, I have noticed clouds of smoke rising from sections of the country where we had not previously noticed any indications of fire.

From range 26 to the fourth meridian the land is rolling and densely wooded with second-growth poplar, birch and balm of Gilead.

At one mile and a half west of the corner of township 64, range 26, the line runs through heavy timber, mostly spruce, covering two square miles. It is estimated that this timber will yield 1,500,000 feet of lumber. Large jackpine from eight to fifteen inches, suitable for railway ties, is found in quantities at many places and spruce from eight to twelve inches is scattered over all the country west of range 25.

The base line ends in section 32, range 26, at the east shore of Cold lake, a large body of water covering about 140 square miles, but in order to check our work the survey was continued around the north shore of the lake up to the meridian.

Wooded ridges generally surround the east side of the lake and I noticed at several places bold sandy bluffs along its shore.

The east shore of Cold lake, near the end of the base line, forms a deep bay, and from there is its outlet, a wide and rapid stream containing several islands, which we forded a short distance from the bay. The bottom is gravel and stones, and its crossing is safe at all times during the summer. This stream runs southeast to Pierce lake, five miles distant. The level of Pierce lake being 110 feet lower than that of Cold lake explains sufficiently the rapids on this stream.

Owing probably to the risk of upsetting their canoes in the rapids, the Indians make use of a portage over the hills between the two lakes.

Pierce lake is about eight miles long and four wide. It lies mostly in townships 63 and 64, range 25. Its outlet is at the east end of the lake and forms by its expansions two smaller lakes before it joins lac des Isles, six miles farther east.



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The last mentioned lake is about eight miles south of the base line and extends across ranges 22 and 23. Where Waterhen river enters lac des Isles the Hudson's Bay company has established a fur-trading post, which is connected by a wagon road to their other post situated north of Waterhen river, and close to the east end of this lake.

One of the roads from Onion Lake settlement comes to the trading post at Pierce lake, so that access to this district is possible at all times.

South of Pierce lake are miles of hay land and a Cree settlement has sprung up in the neighbourhood. All these people own horses and wagons, but none of them appear to have attempted any cultivation of the soil although it is very good. They are satisfied with putting up hay at which occupation they were all busy when we passed at the end of August.

Besides the wagon roads which follow the more open sections there are many pack-trails winding across the woods.

From Sandy bay along the south shore of Pierce lake a pack-trail leads to section 12, township 63, range 1, west of the fourth meridian, passing within half a mile of Cold lake.

We followed this trail when returning to the meridian to complete the levels along that line; it was necessary to widen it somewhat to allow our loaded pack-horses to pass through the woods.

After crossing the hills near Pierce lake this road turns southwesterly towards a more level country which is covered with poplar bluffs alternating with patches of willow scrub near the lakes and hay marshes.

At Cree lake, which is five or six miles east of the meridian, we came to a belt of fine spruce trees up to thirty-six inches. They grow in thick clumps near the lake, but are more scattered, though still of large size, as one approaches the meridian.

The timber begins in the northwest quarter of township 63, range 26, and extends southwest across range 27. There were indications of a recent fire having been started in the vicinity of Cree lake which is frequented by the Indians, but after skirting the west edge of the forest this fire luckily died out within a short distance of the best timber.

Growing among the spruce are poplar from ten to fifteen inches and cottonwood ten to twenty-four inches. Through the woods of this country there is a heavy undergrowth of hazel and other low bushes.

The Cold lake district offers real advantages for mixed farming. Some sections in the surveyed part were taken up a few years ago and the homesteaders have proved the fertility of the soil for growing cereals and all kinds of ordinary vegetables.

There is also plenty of upland hay which is always mixed with large quantities of pea-vine. Wild hay of good quality is also found in the lower land near lakes and ponds and all the creeks contain fresh water.

Last summer many prospective settlers brought their families with the intention of taking up sections of the still unoccupied surveyed lands southwest of Cold lake.

This district is far from being isolated, as some of the roads lead south to the older settlements, while others reach St. Paul-de-Metis and Vegreville.

There is a general store and a post-office near Beaver river which is crossed by ferry.

From Cold Lake post-office in section 15, township 62, range 2, a new road leads in the direction of the Cree settlement, fifteen miles east of the meridian. We came out that way and in order to avoid a long detour we corduroyed this road where it crosses a neck between some hay marshes which spread for a considerable distance north and south. This road has never been properly cleared of brush and till recently was used as a sled road, but it could be improved at a small cost.

## CLIMATE.

During the spring and until the end of June we enjoyed dry, fair weather which had also the effect of subduing to a noticeable extent the mosquitoes and kindred  
25b—10½



pests, but in July and the first part of August hardly a day passed without heavy showers, often accompanied by hail-storms. August and September proved to be ideal months for our work. The summer was appreciably cooler than in Prince Albert, and summer frosts were experienced in the months of July and August, the ice in some cases being a quarter of an inch thick on the water in the tent.

Large game, still plentiful in this country, consists of deer and moose, whose well-beaten paths cross the land in all directions. Bears and the smaller fur-bearing animals, such as mink, marten and weasels, also were met. Of the feathered game ruffed grouse, prairie-chickens, swamp partridges, &c., are quite common in some localities, while ducks and other aquatic birds are seen all summer. Such birds as the pelican and the loon, which are seldom seen near the settlements, remain all summer on the lakes in the northern country.

There is a large supply of various species of fish in all the larger lakes and streams. They consist of pike, pickerel and carp. Trout and whitefish with the above-mentioned varieties are caught all summer in Cold lake but in all such lakes as Pierce lake, lac des Isles and Waterhen lake they are caught during the winter only. Berries such as cranberries, saskatoon berries, wild cherries, strawberries and raspberries are plentiful, and also another luscious kind which grows in all muskegs.

Although no minerals of economic value were discovered in the district adjacent to the base line, there are some localities where bog iron must exist, as proved by the abnormal deviations of the magnetic needle recorded at such places.



## APPENDIX No. 45.

## ABSTRACT OF THE REPORT OF W. A. SCOTT, D.L.S.

## MISCELLANEOUS RESURVEYS IN SOUTHERN SASKATCHEWAN AND ALBERTA.

My first work consisted of the retracement of townships 7 and 8, range 6, and township 8, range 7, west of the fifth meridian. The country in this vicinity is fairly well settled and is rapidly becoming fenced up. The trails followed at present are chiefly old trails, but in a few years the road allowances will be the only means of travel.

This part, and in fact the whole country from the main line of the Canadian Pacific railway south to the international boundary, was devoted chiefly to the raising of horses, but in the last few years as the homestead lands in the West have been rapidly taken up, this part has been filling up with settlers, until now ranching to any large extent has ceased.

The surface is rolling prairie of which only a very small part, the deep coulees of the small creeks, cannot be brought under cultivation. The greater number of these creeks are dry for the most of the year and only those of considerable size continue to run during the summer. The rainfall is light, the greater part of the moisture being precipitated during the months of May, June and July, and the climate may be said to be dry. The question of water supply is one of paramount importance and will eventually be solved by irrigation or dry farming.

The nearest railway at present is the Crowsnest branch of the Canadian Pacific railway, there being no other railway between this and the international boundary. This means that some of the settlers have a haul of sixty or seventy miles.

There seems to be a large number of small mines in this vicinity where lignite is mined in small quantities to supply a local market.

The next work was the survey of coal lands in townships 9, 10, 11, 12 and 13, ranges 4 and 5, west of the fifth meridian. The best route for reaching these townships is by leaving the Crowsnest branch of the Canadian Pacific railway at either Cowley or Lundbreck and following a fairly good wagon road to the 'Gap' which is the pass of Livingstone river through the Livingstone range. The road as far as the 'Gap' is fairly good, but beyond that it is merely a trail. Wagons may be used up Racehorse creek a distance of four miles, then up Livingstone river to the fourth base line and up the northwest branch as far as section 9, township 12, range 4, where there is a building, once used by the Great West Coal company, but now deserted. There are good pack-trails following the courses of all the large creeks. These pack-trails have been improved to a very great extent by the fire rangers located in this district during the past season, and I believe more improvements along this line will be carried on during the ensuing years.

The Livingstone range follows a course almost due north and distant about two miles from the east boundary of range 4. Between the Livingstone range and the range of mountains defining the boundary between Alberta and British Columbia the country is of a mountainous nature but there are no distinct mountain ranges. There are many hills as high as the Livingstone range itself, but they are almost all wooded except the tops which are bare rugged rocks. There is scarcely any timber of any commercial value east of the east boundary of range 5, but from there west to the boundary of Alberta there is a great deal of jackpine from twelve to thirty inches in diameter.

The greater part of townships 9, 10, 11 and 12, range 4, was burned over in July, 1910, and most of the timber was destroyed. However, in some places where the fire



burned at night or during a day with little or no wind, it was confined chiefly to the ground and underbrush and the trees were not killed. This was the case to a greater extent in the northerly townships than in the southerly part as there was more wind-fall in the latter.

The hills abound in coal of a very good quality. On almost every hilltop could be seen an exposure of a coal seam and sometimes several seams. The dip of the rocks is to the west and varies from 30 to 60 degrees, while the strike is almost due north. This formation gives an easy slope from the west ending abruptly at the hilltop in a precipitous rock face towards the east. The coal formation as a rule lies immediately below a conglomerate formation which is readily distinguished from the other formations.

All the streams have a good fall and are very rapid, and water-power could be developed on almost any of them, for although the flow of water would be comparatively small, there is almost no limit to the head that could be secured.

The streams teem with trout and many tourists take advantage of this sport. There are also a few deer and bears and there are mountain sheep and goats in the more rugged parts. There is an ever increasing number of sportsmen visiting this country and they are pushing farther and farther back into the mountains as the trails are opened.

The season for survey work in these mountains is rather short as it is not profitable to commence work west of the Livingstone range before June and operations have to be closed some time in November. There was so much snow in November of the past season that the party was withdrawn and paid off on the 16th.

During the remainder of the season a number of miscellaneous surveys were performed in Alberta and Saskatchewan, including work in townships 32 and 33, range 10, township 32, range 11, and township 26, range 15, west of the third meridian, and township 41, range 13, townships 45 and 46, range 16, township 45, range 17, and township 60, range 25, west of the fourth meridian.



## APPENDIX No. 46.

## ABSTRACT OF THE REPORT OF P. B. STREET, D.L.S.

## MISCELLANEOUS SURVEYS IN MANITOBA, SASKATCHEWAN AND ALBERTA.

The party was organized for the season at Lethbridge and having made all the necessary arrangements we left there on May 10 for Milk River where we arrived the following day. The district from Lethbridge to Stirling is mostly undulating prairie, with a rich clay loam soil. Under the irrigation system good crops are grown, and the majority of the farms are wholly cultivated. South of Stirling the country is more rolling, but the soil is uniformly good, and the crops are usually heavy. Here we saw irrigation ditches entirely filled with dirt which had drifted in during a heavy windstorm on the previous Saturday. The whole district is settled by Mormons.

We commenced the retracement of township 2, range 13, west of the fourth meridian on May 14, and completed it on June 1. Milk river flows easterly through the southern part of this township and is the chief source of water supply for the settlers. The soil is mostly sandy loam and is better suited for mixed farming than grain growing. The whole township is settled but only about twenty per cent of the land was under cultivation last season.

Our next work was a restoration and retracement survey of township 2, range 12, which was completed on June 15. Part of this township is under lease to the Deer Creek Cattle company, but the remainder is all settled. The soil is sandy loam and considerable stone and gravel is found in places. The constant hot winds in this district dry up and scorch the vegetation early in the summer and there are many years when a wheat crop cannot be raised. Mixed farming, would, however, prove successful.

On June 16, we commenced the retracement of township 2, range 14, but our progress was greatly impeded by the inaccessible banks of Milk river, the trails which formerly led to the fords having been fenced up by the settlers. The soil in this township is clay loam and holds the moisture much better than in townships 2, ranges 12 and 13, and I would judge that dry farming would be successful.

Having completed the work here, we left on June 30, for the Crowsnest pass which we reached on July 10. The country through which we passed on this trip looked very prosperous, and the grain, although a little backward at that time of the year, looked very healthy and promised a fine yield. Around Raymond a great many sugar beets are grown for the Knight Sugar company which is located there. Small fruits are also grown successfully in this district, and some settlers have recently planted fruit trees which may prove a successful venture.

West of Cardston one cannot help noticing the decided improvement in the vegetation over that in the vicinity of Milk River. There is a great deal of cultivated land west of Belly river, although most of the old ranchers have kept a portion of their holdings for pasture. The settlers in the Pincher Creek district are turning to mixed farming and stock-raising, as the last two years have proven that in this district wheat crops cannot be depended upon, on account of the early frosts which occur owing to the high altitude.

At Crowsnest business was very quiet, as, owing to the coal strike, many miners had left the district temporarily.

Our work here, in township 8, range 5, west of the fifth meridian, consisted in extending subdivision lines across Sentinel and Summit mountains and traversing a



portion of Island lake. Here we lost a few days owing to the clouds descending to an altitude of 6,000 feet which was below the level of our work in the mountains. No indications of coal were seen in this township, as the rocks are mostly of limestone formation. Limestone is quarried and burned in section 7.

Our next work was in township 5, range 4, and consisted of the extension of subdivision lines to include certain coal lands. For this work, owing to the mountainous nature of the country, frequent flying camps were necessary. The northwest quarter of this township contains some rather poor timber, but the remainder contains an unusual amount of first-class timber. Spruce from twelve to forty-two inches is found in large quantities as well as some good jackpine, but very little fir was seen, as the altitude was too great.

The coal seams of the Premier Coal company have some remarkable showings, and the seams can be traced across country for miles. It is an excellent coking coal and burns very clean.

Our work in township 5 was at an altitude of from 6,000 to 7,000 feet, and here as at Crownest, we were delayed by cloudy weather. On September 5 snow fell to the depth of one foot and there were several snowfalls more before the end of the month.

From here we moved to township 4, range 1, where we traversed Fisk lake. This township, as well as several townships south and east, is well adapted for ranching, as there is an abundance of feed, water and shelter. The present settlers, however, seem to prefer farming, and a great deal of baled hay is annually shipped from this district.

After doing some retracement work in township 7, range 30, west of the fourth meridian, we left for Milk River to retrace township 2, range, 15, which we reached on November 3.

The weather turned very cold on the 7th, the temperature falling to  $-20^{\circ}$ , and a strong wind blowing made a regular blizzard till the 10th.

We finished the retracement of this township on November 21, and on the following day I paid off the party retaining only one assistant.

During the remainder of the season I and my assistant removed some duplicate monuments in township 9, range 21, west of the second meridian, traversed Icelandic river in township 23, range 3, east of the principal meridian, retraced some lines in township 21, range 4, and investigated the marking of a witness post in township 23, range 6, both west of the principal meridian. Having finished this work, I paid off my assistant at Winnipeg and left for Toronto, where I arrived on December 29.



## APPENDIX No. 47

## ABSTRACT OF THE REPORT OF C. H. TAGGART, D.L.S.

## SURVEYS IN THE RAILWAY BELT, BRITISH COLUMBIA, IN THE VICINITY OF KAMLOOPS.

My first work was establishing the north limit of the Monte Hills forest reserve. The route to this work was along the road from Kamloops to 'grand prairie' for twelve miles. From there a branch road to Campbell lake was followed, and then a rough wagon road to Wolf lake. From there to where the north boundary of the reserve crosses the summit of the hills, there being no road, a pack-trail had to be cut out.

The surface of the country along this boundary is very rough and is densely wooded with jackpine from three to fifteen inches in diameter, and scattered spruce up to forty inches. The soil is a sandy loam with gravel subsoil, and in some places the rock is found close to the surface, while in others it is solid rock outcrops.

The south limit of the railway belt in townships 16, ranges 15 and 16, was our next work. To reach this we had to return over our old route to Campbell lake, and then proceed via Barnhartvale and Napier lake. The road between these two places follows a narrow valley the bottom lands of which produce hay and alfalfa in large quantities, and while cattle-raising was formerly the chief industry, fruit growing is now obtaining prominence. At the foot of Trapp lake a large portion of land is being divided into fruit farms of ten and twenty acres each and an extensive irrigation system is to be installed.

In townships 16, ranges 16 and 17, some good grazing land was noticed, but easterly from section 21 in range 16, the country becomes rough and rocky, and difficulty was experienced in getting a road for the pack-horses. As our next work lay in township 17, range 13, we cut out a pack-trail to the wagon road along Salmon river. The district around 'grand prairie' in this township is being subdivided into fruit farms, and the water of Salmon river is to be used for irrigation purposes.

We next proceeded to timber berth No. 530 on Kingfisher creek, in township 20, range 6, which was our next work. A good wagon road took us as far as Enderby on the Okanagan branch of the Canadian Pacific railway. From Enderby to the mouth of Kingfisher creek the road was rough and from there on we were forced to follow the creek bed through water waist deep and very swift.

The survey of timber berth No. 545 in township 23, range 18, west of the fifth meridian was our next work, and having completed this on August 17 we began subdivision in section 12, township 24, range 19. In this valley, from Golden south to the limit of the railway belt, there is a rich agricultural district, but the best land is included in timber berths, and although the timber is cut off very little improvement has been made as titles cannot be obtained by the squatters, some of whom have lived there for ten years. Wherever development has taken place the results obtained have been excellent, especially with the small varieties of fruit. The bench lands as well as the bottom-lands are being taken up, and though the former may require irrigating an abundant supply of water is available from the mountain streams. Good roads lead through the valley and steamers ply on the river.

We completed the work in this valley on September 30 and left for Revelstoke to perform some surveys in township 23, range 2, west of the sixth meridian. This was completed on October 26, and from then until November 28, we were engaged in traversing the right bank of Columbia river in township 22, range 2, and township 21, range 1, retracing section lines in the same townships and also performing a



small amount of traverse in township 21, range 1, west of the sixth meridian, and in township 21, range 29, west of the fifth meridian. During the progress of this work we experienced a three days' blizzard followed by a three days' sleet and rain-storm which greatly retarded our progress.

The lower Columbia valley south of Revelstoke averages about one and a half miles in width. It is mostly covered with a dense growth of under brush and is timbered with cedar from four to twelve feet in diameter. Some hemlock of good size was also noticed but cedar is the chief asset. The soil is mostly a sandy loam with gravelly subsoil, and so porous that irrigation is necessary. Fruit growing here is only in the experimental stage yet, but good crops of vegetables grow wherever the land has been developed, and a convenient and ready market is found in Revelstoke.

The work in the vicinity of Revelstoke being finished we moved to Kamloops to survey the south limit of the railway belt westerly from the southeast corner of section 25, township 17, range 16, west of the sixth meridian, and also to perform some retracement and resurvey in the same district.

From here we moved to Trout lake in township 17, range 19, west of the sixth meridian, to make a traverse of the lake, establish section corners and lay out building lots for summer cottages. The lake is in the centre of the Long Lake forest reserve, twenty-one miles from Kamloops, and is accessible by a wagon and automobile road. It is the only convenient summer resort for Kamloops, and being twenty-nine hundred feet higher than the city the air is always fresh even in the hottest weather.

Our last work was the survey of a parcel of land in township 22, range 17, west of the sixth meridian, in the valley of North Thompson river. The Canadian Northern railway company are making rapid progress with the construction of their line on the east side of the river, and it is expected that this portion of the road will be in operation within two years.



## APPENDIX No. 48.

## ABSTRACT OF THE REPORT OF C. M. WALKER, D.L.S.

## MISCELLANEOUS SURVEYS IN SOUTHWESTERN ALBERTA

We left Calgary on May 9 for township 21, range 7, west of the fifth meridian, where our first work of the season was located. The eastern boundary of this township for the first four miles, follows along the steep side-hill of a high mountainous ridge which, previous to the fires of 1910, was covered with a fair growth of spruce and jackpine from six to fifteen inches in diameter; now, however, this ridge, as well as the greater part of the township, presents a very desolate appearance, consisting only of barren rock slides and brulé with here and there a clump of dead spruce or jackpine.

Elbow river flows northward at a distance of from thirty to eighty chains to the west of the east boundary of this township, until near the northeast corner of section 24 where it flows east into township 21, range 6. Its width varies from seventy-five to three hundred links, and it has a uniform, though rapid fall, although no rapids of any account occur along this part of its course. The river-flat, consisting of gravel bars, has a breadth of five to forty chains in range 6, and this would prove an ideal storage basin for power purposes, as there is an excellent location for a dam in section 8, township 22. That such a storage basin is necessary to develop power is evidenced by the fact that on May 27 there was no flow of water in the main stream of Elbow river above Fisher branch, and three days later, when the snow began to melt, our horses were swept off their feet and carried about fifty yards down stream while fording this same river. A rise of two feet in the stream in six hours is not an unusual occurrence.

Our next work was the survey of the north and east boundaries of township 21, range 6. The east outline runs through country similar to that in the township to the west, though there is much less rock and the ridges are not so high. The surface, however, is rolling and cut by deep ravines. Threepoint creek canyon crosses the east boundary of section 1 in a northeasterly direction. It is four to five hundred feet deep and has loose broken shaly precipitous sides; there are, however, no indications of coal. A valley running northwest from Threepoint creek contains the only valuable land in this township. It includes section 11, the west halves of sections 14 and 34, sections 15, 22, 27, and the east halves of sections 28 and 33. The land in this valley is inclined to be boggy, but it could be very easily drained. It produces excellent hay, and, along with several small adjoining valleys, would make a good ranching district. The climate, however, would render farming out of the question as we had snowstorms or heavy frost every week throughout the whole season. No indications of minerals were found in this township, but game, consisting of deer and prairie-chickens appeared to be plentiful.

Having completed the work in township 21, range 6, we moved to township 22 to perform some subdivision surveys. The western third of this township and sections 28 and 33 are exceedingly rough, being composed of steep hillsides, bluffs and canyons from four to nine hundred feet deep. Some good spruce is found in section 6, and along Prairie creek in the northeast quarter of section 18, but elsewhere fires have destroyed all the merchantable timber. A redeeming feature of this part of the country is the remarkable number of outcroppings of lignite which occur in the vicinity of Canyon creek. As almost all of these outcroppings occur on approximately the



same level it would appear to indicate the presence of a seam or seams extending for some miles up the canyon.

Considerable development work has already been done. The southeastern portion is very rough with no standing timber of any account, and, though the surface consists of mountainous ridges, it shows no indications of minerals whatever.

A strip of level land extends along the south bank of Elbow river in sections 9, 10, 11, 15 and 16. It has excellent drainage facilities, and consists of good clay and sandy loam on a gravel subsoil, but summer frosts prevent the raising of even potatoes. Hay, however, grows in this flat, and also in a flat on the north side of the river in sections 24 and 25. Sulphur springs are located along the north branch of Canyon creek in sections 29 and 32, which give a strong taste and odor to the water.

Elbow river enters this township on the south boundary of section 4. The river flat varies from twelve chains to the bed itself and consists of gravel bars and boulders with here and there an occasional spruce. The rapids begin where the river enters section 5 and form a continuous series of cataracts to the centre of section 8, where an ideal location for a dam is formed by the high, rocky banks which are only eighty links apart at the river level. This dam could be used for either power or storage purposes.

The next rapids begin where the river enters section 16, and terminate at the falls, where there is an abrupt drop of about thirty feet, the entire volume of water passing between rock projections only forty links apart. From the falls to the mouth of Canyon creek in section 15 the river is a continual series of rapids, and in the canyon of the Elbow in the eastern part of section 15, the river has worn its way several hundred feet below the surface and runs through a rocky defile about one chain in width. A dam could be erected at the head of the canyon at little expense, as construction material is abundant.

After completing the traverse of this portion of Elbow river we resurveyed the east boundary of township 23, range 7, as far as the northeast corner of section 12, and produced the line by triangulation over Moose mountain, which is about eight thousand feet high. Immense gulches over one thousand feet deep and severe snowstorms greatly retarded our progress.

Many outcroppings of coal appear around Moose mountain, particularly in sections 4, 5, 8 and 9, in township 23, range 6. Several seams from four to twenty feet thick have been uncovered in section 8, and in the northeast quarter of the section a tunnel about one hundred and fifty feet in length has been driven into the hillside. The coal is said to be excellent for steam producing purposes.

The entire western portion of township 23 is very rough while the eastern part is more open and includes several hay meadows. There are no large streams and consequently no water-powers, but Little Jumpingpound and Bragg creeks have their sources there.

Our next work was a resurvey in townships 14, ranges 7 and 8, west of the principal meridian. Township 14, range 7, is very wet and covered with a dense growth of reeds and rushes eight to ten feet high. The southern tier of sections contains some tillable land but the remainder of the township is mostly under water. Delta, a small summer resort in section 14, is the terminus of a branch of the Canadian Northern railway. The shore of the lake at Delta is sandy and very shallow furnishing an ideal place for bathing.

Having traversed the lake across range 7 I performed some subdivision in range 8 and closed operations for the season on January 4, 1912.



## APPENDIX No. 49.

## ABSTRACT OF THE REPORT OF J. N. WALLACE, D.L.S.

## LEVELLING NORTH FROM PRINCE ALBERT AND LLOYDMINSTER.

Our work for the season of 1911 consisted chiefly of the running of two lines of levels, one northerly from Prince Albert and the second northerly from Lloydminster. These were run to connect the levels along the meridians and base lines with railway elevations, these latter being, at present, the only available sources of information in the western provinces regarding sea-level.

A reference to the system of levels taken along base lines may serve to explain the necessity of these connections. The system of taking levels along base lines was inaugurated in 1908. In that year sixty-six miles were run along part of the eleventh base line west of the fifth meridian. During the seasons of 1909, 1910 and 1911 levels were run along more than eleven hundred miles of line, making a total of over two thousand four hundred miles of levels, all of this being along meridians or base lines. The distribution of the mileage is as follows:—

Along the principal meridian and adjoining base lines two hundred and fifty miles, along the second meridian and base lines westerly seventy miles, along the third meridian and westerly two hundred and thirty miles along the fourth meridian and westerly five hundred and eighty miles, and along the fifth meridian and westerly six hundred and twenty miles. No levels have yet been run along the sixth meridian itself, but six hundred and thirty miles have been run on base lines to the west of it.

These levels, while not yet connected as a whole, are, as far as possible, connected in groups. Owing to the fact that levels were not taken in former years, and on account of the great expense it would cost to now reopen, for the purpose of taking levels, lines surveyed years ago, it is not possible to directly connect many of the new level lines. This difficulty, however, will rapidly disappear as time goes on, as levels are now taken along all base and meridian lines, thus keeping up a continuous connection. Each season's work will then be commenced with a known elevation, not on an assumed one, as at present, and the level records will be immediately available for use in themselves, and will afford comparison with other connected lines.

As regards the accuracy with which these lines have been run, the only checks available up to the present date have been the closing of two circuits, and the comparison between themselves of the two level lines always run along each base line or meridian during its survey. The circuits were composed of two neighbouring base lines with meridian lines as east and west boundaries. In the first case, the total length of circuit was three hundred and sixty-two miles, and the closing error 1.79 feet, which would correspond to a mean error of +0.005 feet per mile, or an accidental error of  $\pm 0.09$  feet per mile. In the second case the circuit was two hundred and four miles long and closed within 1.16 feet, the corresponding errors being +0.006, and  $-0.08$  feet per mile. So far as the comparison of original and check levels on each line affords indication of accuracy, this difference may be considered as very seldom exceeding  $\pm 0.05$  feet over any one mile.

It is seen from this that the lines of the base line system are sufficiently accurate to make the present uncertainties of railway elevations in different parts of the West altogether greater than any accumulated errors which are likely to occur in the system and for this reason something better than railway elevations is necessary on which to base the elevations. The area over which the system extends is too great for a single



connection with one precise elevation, but several connections should be made, the most suitable points of connection being near the southerly end of each of the meridians. When a precise line of levels has been run along some railway extending east and west it will form a fundamental basis from which to run these connections northerly.

It was as a part of this general project of connecting the whole base line system, and in order to obtain reliable sea-level elevations at intervals that the two lines already referred to were undertaken. As already stated the first was from Prince Albert. It runs northerly along the Montreal lake road for thirty miles, to the intersection of the third meridian and the fourteenth base. The second a line of eighty-three miles long was run northerly from Lloydminster to the sixteenth base connecting with it a few miles east of the fourth meridian. In the first case the temporary datum used was that of the city of Prince Albert, which probably originated from the survey line of the Regina-Prince Albert railway many years ago. As regards the Lloydminster line, the datum used was that of the Canadian Northern railway. Both these data are more or less uncertain within a possible limit of as much as thirty feet, but in both cases absolutely no other datum was available for temporary use. Both these connecting lines of levels were run in the field by Mr. C. de la Condamine, D.L.S. He reports as follows:—

‘I left Calgary on May 30, for Prince Albert to run a line of levels to connect the third meridian levels with an elevation in Prince Albert. I reached there next day and at once began to organize my party. As a preliminary I drove from Prince Albert to the northeast corner of township 52, range 1, to ascertain the best route to follow and to identify Mr. Saint Cyr’s bench-marks on the meridian.

Actual levelling operations were commenced at Prince Albert on June 12 by connecting the rail level at the Canadian Northern railway station with a permanent bench-mark which I established on the post-office building, and with a bench-mark I found on the railway bridge over Saskatchewan river, which latter was subsequently found to have been established on an assumed datum, by the Public Works Department survey of this river.

The line of levels was then run northerly along the surveyed highway known as the Montreal lake road.

No difficulty of a serious nature was encountered, but the country being somewhat hilly in many places and the road not being cut out very wide where it runs through bush, many small delays occurred.

The total distance along the line of levels from Prince Albert to the southerly end of Mr. Saint Cyr’s work is thirty miles. This work was completed on July 14.

The main object of the work was to connect the levels of the third meridian and neighbouring base lines to a railway datum, but in addition bench-marks were established along the whole route from Prince Albert. These consist of an iron section post, sunk in two feet of concrete under ground and appearing about six inches above the surface.

Three bench-marks were established at Prince Albert and seven others were placed between there and the north of township 52, at which latter point connection was made to Mr. Saint Cyr’s bench-marks. The intermediate bench-marks were, as a rule, placed near the survey posts marking the angles of the road survey, reference distances being recorded to the survey post and the number of the post noted. The bench-mark is a round solid iron post flattened near the top and marked ‘B.M.’ with a number following.

I found the general elevation on the third meridian at the north of township 52 to be two hundred and eighty-three feet above the rail level of the Canadian Northern railway at Prince Albert. Taking this latter as at an elevation of 1,393 feet above sea-level (which is not at all a certain elevation, but the best available at present) this would make the north of township 52 at a general elevation of some 1,676 feet above sea-level.



## SESSIONAL PAPER No. 25b

On completing this work I proceeded at once to Lloydminster in order to run a line of levels northerly from the railway there to give a datum for the levels along the fourth meridian and adjoining base lines.

I reached Lloydminster on July 15, and after establishing several bench-marks in the town and connecting them to rail level at the station, the line was run north-  
only, following in general close to the fourth meridian. From Lloydminster to Onion Lake the country is all prairie, but north of Onion Lake it is wooded and as the line of levels had to be run along the only available wagon road, which is very crooked, the full length of sight could not be taken except in a few cases.

Two routes could be followed from Lloydminster. One is a surveyed highway following near the meridian, generally good except that it has many steep gradients across townships 52 and 53. The other is a more generally travelled road which crosses Saskatchewan river at Hewitt landing. This latter is not so hilly as the graded road but it is longer and on the whole it was thought best, for purposes of easier recording of bench-marks, to keep along the graded road in the immediate vicinity of the meridian, and this was the route I followed.

The only difficulty encountered was the crossing of Saskatchewan river at the fourth meridian. The river is over one thousand one hundred feet wide and, when I crossed it I was unable to find any sand-bar on which to set up the level, or indeed any means of shortening the distance. I then proceeded as follows:

The instrument was adjusted carefully and the error of adjustment measured. Then a rodman crossed the river and established a temporary bench-mark on the south shore of the river. The rod was thirteen feet long and the stadia constant was 1/100. It was therefore possible to bring the three wires on the rod. After several trials the instrument was set up on the north shore at such an elevation that the middle wire came about at the middle of the rod. Then the second rodman established a temporary bench-mark near the instrument at such an elevation that the middle wire came near the middle of the rod. This was necessary to allow the north rod to be sighted on from the south shore. The three wires were read on the far rod and then on the near rod. The instrument was then shifted and the process was repeated three times, this giving nine readings on each rod. Results were compared at once and as they agreed satisfactorily it was thought a fourth setting was unnecessary. In order to correct the error of adjustment of the instrument I repeated the same process with the instrument set up on the south shore. The rods were interchanged, the one which was on the south shore being on the north one in the second operation.

Of course at such a distance it was impossible to read the hundredths of a foot; even the figures indicating the tenths could not be read but the tenths could be counted and the hundredths estimated.

In order to give some idea of the accuracy of this method I give below the values of the upper and lower intervals read on the far rod:

Intervals. . . .	} 5.580	5.710	5.750	5.630	5.630	5.670
	{ 5.530	5.710	5.750	5.760	5.640	5.700
Difference. . .	0.050	0.000	0.000	0.080	0.010	0.030

The value of one division of the level was 10" of arc. It was therefore possible to estimate about 3". At a distance of one thousand one hundred and forty feet, this gives a possible error of about 0.02 of a foot. The maximum error due to this cause when reading an interval is therefore  $\frac{1}{100}$  of a foot and the probable error 0.028. Two differences are beyond this value. Probably the largest error comes from the fact that the wires cover several hundredths of a foot and therefore the hundredths cannot be estimated with accuracy.

North of Onion Lake I followed the Ministikwan lake trail. This crosses the fifteenth base about four hundred feet east of the northeast corner of section 33.



range 26, and the sixteenth base about a quarter of a mile west of the northeast corner of section 33, range 25. Though rough it is a good wagon road and very few muskegs occur.

Connection was made on the fifteenth and sixteenth base lines to bench-marks already established during the survey of these two base lines.

From Lloydminster to Saskatchewan river one line of levels was run northerly and at the end of the season as a check, a second line was run southerly while north of Onion Lake the work was checked by a second line in sections about a mile long. This latter I consider much the better way. Camp need not be moved so often, and account can be kept of the way the work is proceeding, so that if any small errors are accumulating they can be at once detected, and means taken to avoid their continuance. Moreover, temporary bench-marks may become unreliable if the check levels are delayed for any length of time.

Permanent bench-marks, of the same nature as those left on the Prince Albert line, were left along the route from Lloydminster to Onion Lake, but north of Onion Lake, owing to lack of cement I had to use trees for bench-marks.

The country is undulating to within one mile of the north boundary of township 51, where the elevation is about one hundred feet below Lloydminster. From here northerly the land is hilly but still falling northward, the lowest elevation being in the southerly part of township 52, where the elevation is two hundred and twenty-five feet below Lloydminster. The ground then rises, attaining its highest elevation near the northeast corner of section 12, in township 53, where it is about one hundred and ten feet higher than Lloydminster. From here northerly the land falls again to Saskatchewan valley; the level of the water in August was four hundred and eighty feet below Lloydminster when I was going north and six feet lower when returning in October. The elevation of the rail at Lloydminster, according to the Canadian Northern railway, is 2,102 feet above sea-level. Using this as a temporary datum the elevation of the river would be 1,626 feet in August and 1,620 feet at the end of October.

Going north from Saskatchewan river the general elevation of the country steadily rises. About two miles north of the river its elevation is 1,820 feet. At Onion Lake, the ground in front of the English mission is 1,970 feet. The Hudson's Bay post being on a local hill is a good deal higher. Where the Ministikwan lake trail crosses the north of township 55, the elevation is 2,190 feet, or eighty-eight feet above Lloydminster.

From here there is a fall northerly to the valley of Beaver river. The water in Blackfoot lake is 1,989 feet and that of Mudie lake is 1,722 feet above sea-level.

Having made connection to bench-marks on the sixteenth base, I returned to Onion Lake and checked the whole line southerly from there to Lloydminster, where I ceased work on November 8.

All the computations on the two lines run have been completed, and the corrections found to connect the data used during the survey of the several base lines with the elevations at Prince Albert and Lloydminster. These corrections give a temporary approximate sea-level datum for over eight hundred miles of levels already run which, while no more accurate than the best available datum at these two railway points, is yet much better than the previously entirely unknown conditions, under which the levels along base lines have had to be run in the past.



## APPENDIX No. 50.

THE DETERMINATION OF THE MAGNETIC DECLINATION, DIP AND TOTAL FORCE IN  
WESTERN CANADA.*D. E. Chartrand, B.Sc.*

Although the compass is not used in running lines on Dominion Land surveys, it is a valuable accessory especially in unexplored parts of the country. Where no line of definite bearing is available, it may be used advantageously as a finder of Polaris in daylight observations for azimuth. To accomplish this, however, a knowledge of the local magnetic declination is necessary; in other words one must know within a reasonable degree of accuracy the angular interval between magnetic north and astronomic north.

*Historical sketch.*

The accurate determination of the magnetic elements in western Canada dates as far back as the year 1842 when Lieutenant J. H. Lefroy, under the direction of the Royal Society, made a magnetic survey of that portion of the country. Magnetic observations were taken in the year 1887 by the Topographical Surveys Branch. Nothing further to any extent was done by this Branch until 1908 when Dominion Land surveyors employed by the Department were instructed to observe the magnetic declination during the course of their surveys.

An isogonic map, on a very small scale, was published in 1904, chiefly from data obtained from Lefroy's survey and the 187 observations of this Branch. Some information along the International boundary and around the Great Lakes was obtained from the United States Coast and Geodetic Survey. This map was intended only for the use of Dominion Land Surveyors employed by the Department.

In 1911 an isogonic map, on a very small scale, of that portion of Canada south of the 54th parallel of latitude was prepared and published in two sections, one for eastern Canada and the other for the western provinces. The declinations used for the western section were derived from the observations of this Branch. The sources of information for the compilation of the eastern section were: the Director of the Meteorological Service at Toronto, the British Admiralty charts, and the United States Coast and Geodetic Survey.

*Area covered.*

As the survey operations under this Branch are confined entirely to the lands under the control of the Dominion government, the stations occupied since 1908 are limited to the provinces of Manitoba, Saskatchewan, Alberta and British Columbia. The districts where meridian, base line and subdivision surveys have been in operation since that date have been dotted with stations for the magnetic declination. A special effort has been made to gather magnetic data from the settled districts by means of travelling parties employed on miscellaneous surveys. These surveyors generally cover a wide stretch of country and provide the only means now at our disposal of observing the magnetic elements in the settled parts of western Canada.

## DECLINATION.

*Description of Compass.*

The determination of the magnetic declination is made by means of a trough compass attached to the standards of the transit theodolite used on the Dominion Land



surveys. The needle is made as light as possible in order to reduce friction on the pivot to a minimum. The graduation of the end blocks consists of a single fine line and readings are made on both ends of the needle. The range of readings of a first-class needle, well balanced, and in the hands of a competent observer, can be expected not to exceed two minutes. The original method of attaching the compass to the standards consisted of a hook at one end and a thumb-screw at the other, but as this was not always found to be satisfactory, the hook was discarded, and the compass attached by thumb-screws at both ends.

#### *Method of Observing.*

The method adopted for the determination of the magnetic meridian is given in Appendix C of the Manual of Instructions for the Survey of Dominion Lands. The observer is instructed to proceed as follows and to note the following remarks:—

1. Place the instrument on a section line and after adjustment set the vernier to read the astronomical bearing of the line.
2. Release the lower clamp, direct the telescope on the line and fasten the lower clamp.
3. Release the vernier clamp and turn the vernier plate until the north end of the magnetic needle, observed with a magnifying glass, is seen exactly opposite the zero mark. Tap the trough lightly with the pencil or hit the milled parts of the foot screws with the finger nail to be sure that the needle has taken the position of rest. Note the reading of the horizontal circle. Take several readings by repeating the operation.
4. Repeat operation No. 3 for the south end of the needle.
5. Enter in the notes the place of observation, date, hour of the day, weather and other remarks, if any. It is important to record auroras occurring within 24 hours of the time of observation.

The observations should be taken only when the needle is nearly stationary, say in the afternoon after 5 P.M., if possible.

In taking the needle out of the trough, whether to rebalance it or to clean the agate, care should be taken to see that it is put back in its proper position. If replaced in the reverse position the index correction would be altered. For this reason, to safeguard against error, the position of the compass whether 'compass west' or 'compass east,' should be entered in the remarks after each observation when observing.

The returns should also state whether the observations are recorded in the mean time of the place or standard time.

The direction of the magnetic needle is subject to a daily fluctuation called the diurnal variation. During the greater part of the night the direction is not far from normal. In the early morning the north end of the needle in Canada moves towards the east, reaching its maximum deflection about 7 or 8 A.M. The motion is then reversed, the north end travelling westward, and crossing the normal direction about 10 or 11 A.M. The extreme western position is reached in the afternoon and then the needle comes back to its normal position at some time after 5 or 6 P.M. This march is subject to wide variations during magnetic storms. The magnitude of the diurnal variation is not constant. Observations at both eastern and western elongations of the needle on the same day, that is between 7 and 8 A.M. and between 1 and 2 P.M., give the best results, and it is desirable that when convenient they may be taken then. This gives not only the best value for the declination, but also the diurnal variation, which it is very useful to know. Failing this, however, the best time to observe is after 5 P.M. when the needle is about in its normal position. It is true that the normal position is crossed generally between 10 and 11 A.M. but the motion being very rapid and the time of crossing uncertain, the afternoon observation is preferable.

The place of observation must be at least three or four hundred yards away from wires carrying direct electric current. There must be no iron near the instrument.



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The observer must make sure that he has no iron or nickel on his person. If any magnetic object is not brought closer to the needle than fifteen or twenty times the distance at which an appreciable deflection is first produced, the effect on the needle is negligible in observations of this kind. Avoid transportation of the instrument on electric cars as there are instances of the polarity of the needle being reversed in such an intense magnetic field.

If the needle is sluggish the observation cannot be accurate. The sluggishness is generally due to a dull pivot or a scratched cap. To keep both in proper condition the needle must always be lowered gently on its pivot and never be allowed to play except when actually in use.

*Instrumental constant.*

Through the courtesy of the Director of the Meteorological Service at Toronto, the index correction of every instrument used for observing was determined both at the beginning and at the close of the survey season, whenever possible. If a serious discrepancy was found between the two determinations, it was investigated and the observations taken with the instrument rejected unless the cause of the discrepancy could be satisfactorily explained.

*Reduction of observations.*

In order to give a character of homogeneity to the declination observations, a reduction to a common epoch had to be applied to the observed data. To accomplish this a knowledge of the diurnal and secular variation is necessary. Again as the diurnal variation is subject to extreme fluctuations magnetic storms must be detected. The only method at our disposal for reduction was making use of the daily records of the declinometer at Agincourt, but the observatory being far away from where our observations had been taken, it was thought advisable to compare by actual experiments the fluctuations of the compass in western Canada and those at Agincourt. An observer was instructed to observe the magnetic declination at Rosthern, Sask., during the whole of November, 1910. Rosthern was occupied on account of being advantageously situated as a base station. The observations were taken from 7 A.M. to 4 P.M. at periods ranging from half an hour to one hour, care being taken to observe the needle at its two elongations. The work was carried out in a small silk tent in order to shelter the instrument from the influence of the wind and storms.

A comparison of the results of these observations with a diurnal variation observation taken at Jasmin, Sask., on July 10, 1910, disclosed a diurnal range of the compass in July almost double of that at Rosthern in November.

Later, in the office, copies of the photographic traces of the declinometer at Agincourt were made for the days on which diurnal variation observations had been taken in the western provinces. On these copies were plotted the diurnal variation observations taken in the West so as to correspond in mean local time to the traces of the declinometer, and the points were joined by straight lines. From this investigation useful information was derived for the reduction of our magnetic declinations. According to our expectations mostly all magnetic disturbances shown on the traces of the declinometer were recorded on the diurnal variation curve and both occurred at practically the same instant.

Tables I and II show the comparison of results which has led us to adopt the use of the magnetic records of Agincourt for the reduction of our declination observations. It shows that this method of reduction is well worth the trouble, the precision of the resulting declination being apparently increased about two and one half times. It is felt, however, that this is not much more than a 'make shift' a case of 'doing the best you can with what you have,' and that what we require for proper reductions are the records of an observatory in the Northwest.



In applying reductions the observations have been reduced to the mean of the month of the year in which they were taken. To reduce an observation to the mean of the month, the following procedure was adopted: a tabulation of the mean monthly declinations of each year was obtained from the magnetic observatory at Agincourt. The declination, for the corresponding date and mean local time at which the observation to be reduced was taken, was scaled from the trace of the declinometer at Agincourt. If the trace showed the declination then fairly steady the difference between the mean declination of the month and the actual declination scaled from the trace was applied as a correction to the observation.

To reduce an observation to January of the same year, the difference between the mean declination of the month in which the observation was taken and the mean declination of January was applied to the observation reduced to the mean of the month.

In the absence of any definite knowledge of the secular variation a plus correction of three minutes per year, which agrees closely with the mean secular variation of the corresponding western portion of the United States as shown on the isogonic map of the United States Coast and Geodetic Survey published in 1905, was adopted for the reduction of our declination observations to January 1st, 1912 (1912.0). From the few stations in the West which have been reoccupied this would appear to be a close approximation, and the maximum error from this general assumption cannot be large as the period for reduction covers only three years.

#### *Compilation of Isogonic Map.*

In the compilation of the isogonic map accompanying this report the reduced observations only were made use of, except in districts where no other data were available, in which case the declinations as observed were used and the curves of equal declination shown in dotted lines. The observations used for the compilation of this map are appended in Table 4. The observations are arranged in the order of township and range, and the date of each observation is given to the nearest tenth of the year. Column six gives the actual observed declination before any reductions have been applied, and column seven gives this declination reduced to the period 1912.0.

#### *Dip and Total Force.*

During the season 1908 dip and total force observations were taken by Mr. J. E. Morrier, D.L.S., at Norway House, Oxford House, Fort Churchill and York Factory.

In 1910 similar observations were taken by Mr. C. Engler, D.L.S., during his trip from Athabaska Landing to Fort Smith and subsequently by Mr. J. A. Cote at different points between Edmonton and Calgary. Unfortunately the results of these observations were lost during a fire at Carstairs, Alberta.

During the miscellaneous surveys made by Mr. P. A. Carson, D.L.S., in 1910, about 24 stations were occupied for dip and total intensity, between Swan River, Man., and Lashburn, Sask. Every complete observation consisted of a dip, a total force and a dip, the mean dip being used in working out the total force. This complete observation was generally duplicated at every station. In some instances the same station was reoccupied during the season and the results compared with those already obtained.

The instruments used for the determination of these magnetic elements were Dover dip circles, the constants of which were determined both before and after every season's work. The total force constant was the mean of at least six observations.

The results of the observations for dip and total force are given in Table 3.

The following is a copy of the "Directions for the use of the dip circle and attachments in observing for magnetic declination, dip and total force."



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*Selection of Stations.*

The conditions to be satisfied in choosing a magnetic station are freedom from present and probable future local disturbance, combined with convenience of access. Proximity of electric railways, masses of iron or steel, gas or water pipes, buildings of stone or brick, should be avoided. A quarter of a mile from the first, 500 feet from the second, 200 feet from the third and fourth may be considered safe distances. The station should be at least 50 feet from any kind of building. If any doubt arises in the selection of a station on account of the possible existence of local disturbances, two intervisible points a hundred yards or more apart should be selected and the magnetic bearing of the line joining them observed at both. A lack of agreement between the two results is evidence of local disturbance.

When taking the observations, the instrument box, especially the bar magnets, should be 40 or 50 feet away for the declination observation and 25 or 30 feet for the dip and total force observations. All knives, &c., should be removed from the person. It should be noted also that iron is frequently present in buttons, hats, neckties, etc.

*Care and Adjustment of Instrument.*

Care should be taken to keep the instrument in good adjustment, clean and free from dust. A camel hair brush, pith, chamois and tissue paper are supplied for that purpose and will be found in the box.

The dipping needles should be carefully guarded against moisture, and after use should always be wiped dry with chamois or tissue paper. They should be put back in the box with poles of opposite polarity at the same end and should be magnetised afresh for each station.

The bar magnets should be touched with the hands as little as possible and should always be wiped with chamois or tissue paper after the observation to prevent rusting. They should not be allowed to touch each other except at their opposite poles and, when placed in the box, the ends of opposite polarity should be connected by a soft iron armature.

The instrument is levelled in the ordinary way with the plate level.

*Magnetic Declination.*

1. The trough compass supplied should be attached to the upper horizontal plate by means of the two thumb-screws and the telescope to the vernier arms of the vertical circle. The observation for magnetic declination is then taken and recorded in accordance with the instructions given for magnetic declination observations with the D.L.S. pattern transit.

2. The magnetic meridian may also be determined by means of the dipping needle. Set the vertical circle verniers to read  $90^\circ$  and revolve the instrument in azimuth until the needle is bisected by the microscopes and read the horizontal circle. As the dipping needle points vertically when in the magnetic prime vertical, in this way the magnetic prime vertical is found and by applying  $90^\circ$  the magnetic meridian.

The magnetic meridian found in this manner is sufficiently accurate, however, only for the dip and total force observations. Method No. 1 is preferable and should always be adopted when possible.

*Magnetic Dip.*

The needles for the dip observations are carried on the lid of the instrument box. Taking out one of these needles carefully wipe with tissue paper and clean the pivots with pith and having also carefully cleaned the agate planes in the box with pith, place the needle on the brass v's with the face of the needle to the face of the instrument. (The face of the needle is that side which is lettered, the face of the instrument that



side which is graduated.) Turn the instrument in azimuth until it lies in the magnetic meridian (previously determined in the declination observation) and with its face to the east, and lower the needle gently on the agate planes. It will now swing in the approximate position of the dip. When it settles it ought to be slightly raised and lowered once or twice by means of the screw, so as to ensure its being exactly in the centre of the instrument. The vernier arm of the vertical circle is now turned until the north, that is the lower end, is seen to be bisected by the crosshair of the microscope; the lower vernier is then read. Similarly, the upper end is bisected by the upper microscope and the upper vernier read; the needle is then slightly disturbed by the screw and the readings repeated until there are three readings for each end. The instrument is now turned  $180^\circ$  in azimuth so that the face of the instrument is now west and the same number of readings taken for this position. The needle is then taken out of the glass box and reversed end for end of its axis, so that it faces the other way. The six readings are again taken as before for both ends of the needle.

The needle is then taken out of the box, and its polarity reversed in the following manner. Put the needle on the reversing block, face up and secure by the brass centre piece which is intended to protect the axis. Place the reversing block so that the north end of the needle will be on the right hand and the south end on the left. Now take the bar magnets one in each hand, the north pole of the magnet in the right hand lowermost and south pole of the magnet in the left hand, and bring the opposite poles of the two magnets down on the needle, near its centre and one on each side of the brass centre piece. Draw them slowly and steadily outwards over the needle, carrying them over its ends and lifting them some inches above the level of the needle, bring them back to the middle position again and repeat. This should be done five times. Care should be taken to have the motion as nearly parallel to the axis of the needle as possible; the ledge on each side of the reversing block is intended to act as a guide for the magnets to ensure this. The needle is then put face down in the reversing block and the operation repeated in the same way. The polarity of the needle will then be completely reversed.

The observations taken before reversal are now repeated. The mean of the observed inclinations in the eight positions is the dip.

It will be noticed that the mean resulting dip will, by the *reversal* of the *dip circle*, be free from any small error in the verticality of vertical axis and also eliminate index error of vertical circle; that the *reversal* of the face of the needle on the agates will eliminate the error caused by any want of perpendicularity of the axis of the needle to the needle; that the *reversal* of the *polarity* will correct for any want of balance of the two ends of the needle.

#### *Total Force.*

The total intensity may be determined with a dip circle by Lloyd's method when suitable standardization observations have been made at a station where the dip and intensity are known. This method involves first the determination of the angle of dip with a loaded needle, and second, a determination of the angle through which another needle is deflected by the loaded needle when the latter is placed at right angles to it in the place provided between the reading microscopes and protected by the brass shield. As the determination of total intensity by this method is relative, it is necessary to guard, as far as possible, against any change in the magnetism of the two needles and to use the same weight in the field as during the standardization observations. Their polarities *must never be reversed*, therefore, and they must not be allowed in close proximity to the bar magnets when these are being used to reverse the polarity of the regular dip needles. They are found in the copper box at the bottom of the instrument box. The needle which is weighted with the small wire is the loaded needle and is called the 'statical needle'; the other is called the 'dipping needle.' *Neither of these needles must ever be touched with the bar magnets.* Turn the instrument into the magnetic meridian with its face to the east. Revolve the vertical ver-



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niers until the tangent screw points to the north. By means of the small brass clips, attach the statical needle to the vernier plate with its face to the east and its north end next to the tangent screw and put the brass protecting shield in position over it. Place the dipping needle in the usual way on the agate planes, now, moving the vernier arms, read the inclination of the swinging needle as before, both north and south ends, then reverse the vertical vernier plate so that the tangent screw is south of the centre and read the inclination again. It should be noted here that the vertical circle is graduated into quadrants, from 0 to 90 degrees, and that these inclinations should always be read from the north zero, so that if in the former part of the observation, the north end of the dipping needle should be deflected by the statical needle past the vertical line, the reading to be entered is 180 degrees less the actual vernier reading, and, if in the latter part of the observation, the north end of the dipping needle be deflected above the horizontal, the vernier must be entered with a minus sign. The algebraic difference of the two readings is twice the deflection.

The dipping needle is now put away. The statical needle is taken off the vernier plate and placed on the agates, its inclination is now read in four positions in the same way as in an observation for dip, that is, instrument face east, needle face east. Instrument west, needle west. Instrument west, needle east. Instrument east, needle west.

*Frequency and Time of Observations.*

The observations should be taken at least twice at each station whenever possible. Should the two observations not agree within 5 or 6 minutes a third observation should be taken. The most desirable time of day to observe is about the time of eastern and western extremes of declination say at 8 A.M. and 1 P.M., and it is suggested that when convenient these times be adopted.

Suitable forms for the observations are provided. The constant "A" used in the form is a constant for the two total force needles. That and the index correction to the compass have to be determined at the magnetic observatory at Agincourt.



TABLE No. 1.

COMPARISON of the Daily Declination Observations taken by D. E. Chartrand at Rosthern in November, 1910, with Agincourt Magnetic Observatory Record.

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Time.	Nov. 1.											Nov. 12.				Nov. 14.		Nov. 15.	
	Nov. 1.											Nov. 11.				Nov. 13.		Nov. 15.	
7.00.....	30.0	27.0	26.0	29.0	31.5	27.0	27.0	27.0	27.0	31.5	31.0	32.0	32.0	32.0	32.0	30.0	30.0	28.0	28.0
7.30.....	27.5	24.5	27.0	32.0	31.5	28.0	27.0	27.0	28.0	31.5	29.5	30.5	30.5	30.5	30.5	30.0	30.0	31.0	31.0
8.00.....	26.0	28.0	27.5	24.5	31.3	26.5	28.0	26.5	26.5	30.0	29.0	30.5	30.5	30.5	30.5	30.5	30.5	33.5	33.5
8.30.....	28.0	27.0	26.5	25.5	30.0	29.2	29.0	29.0	29.2	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
9.00.....	27.0	30.0	29.0	30.0	31.0	33.0	30.0	30.0	33.0	31.0	33.0	31.5	31.5	31.5	31.5	34.5	34.5	29.0	29.0
9.30.....	23.0	30.0	27.0	31.0	30.0	27.5	27.0	27.0	27.5	29.0	29.0	28.5	28.5	28.5	28.5	32.5	32.5	30.5	30.5
10.00.....	26.5	28.0	26.0	27.5	31.0	27.5	28.0	26.0	26.0	31.0	30.0	31.0	31.0	31.0	31.0	31.5	31.5	31.0	31.0
11.00.....	25.5	26.0	26.5	26.5	29.2	27.5	26.5	26.5	27.5	29.5	32.0	32.0	31.0	31.0	31.0	30.5	30.5	31.0	31.0
11.30.....	26.0	26.0	26.5	30.0	30.0	28.0	26.5	26.5	28.0	30.0	31.2	30.0	30.0	30.0	30.0	30.5	30.5	31.0	31.0
12.00.....	26.0	26.0	26.5	30.0	30.0	28.0	26.5	26.5	28.0	30.0	31.0	31.0	31.0	31.0	31.0	32.5	32.5	31.0	31.0
1.00.....	26.5	26.5	30.0	31.0	29.0	28.5	28.0	28.0	28.5	29.0	32.0	32.0	27.5	27.5	27.5	30.0	30.0	31.0	31.0
1.30.....	26.0	26.0	28.0	29.0	30.0	29.0	29.0	29.0	29.0	30.0	30.0	30.0	27.5	27.5	27.5	30.0	30.0	30.0	30.0
2.00.....	26.0	27.0	29.5	30.0	29.5	27.0	29.5	29.5	27.0	30.0	30.0	30.0	26.5	26.5	26.5	30.0	30.0	34.0	34.0
2.30.....	27.0	28.5	28.0	34.8	30.5	30.5	28.5	28.0	30.5	30.5	30.0	30.0	32.0	32.0	32.0	30.0	30.0	28.0	28.0
3.00.....	26.0	29.0	28.5	31.5	30.0	29.0	28.5	28.5	31.5	30.0	29.0	29.0	31.0	31.0	31.0	28.0	28.0	30.0	30.0
3.30.....	25.0	29.0	30.5	35.0	33.0	31.0	30.0	30.0	31.0	30.0	31.0	31.0	30.8	30.8	30.8	31.0	31.0	31.0	31.0
4.00.....	25.5	30.0	30.0	32.0	35.5	32.0	32.0	32.0	34.0	30.0	30.5	30.5	30.5	30.5	30.5	33.0	33.0	30.0	30.0
4.30.....	26.34	27.66	27.91	29.96	30.81	28.79	27.91	27.91	28.79	31.32	30.45	30.45	30.30	30.30	30.30	31.34	31.34	30.56	30.56
Mean.....	+3.66	+2.34	+2.59	+5.04	+4.69	+5.21	+5.21	+5.21	+5.21	+8.18	+2.55	+2.55	+1.70	+1.70	+1.70	+3.66	+3.66	+3.44	+3.44
Residuals.....	-3.34	-3.16	-.91	-5.46	-1.81	-2.79	-2.79	-2.79	-2.79	-5.82	-1.95	-1.95	-3.80	-3.80	-3.80	-3.34	-3.34	-2.56	-2.56







TABLE No. II.

COMPARISON of the Magnetic Declination at Rosthern, Sask., as obtained without any Reduction and as obtained by Reduction from Magnetic Observatory Records at Agincourt.

Time.	NOVEMBER 1.				NOVEMBER 2.				NOVEMBER 3.				NOVEMBER 4.				NOVEMBER 5.			
	Without Reduction.		With Reduction.		Without Reduction.		With Reduction.		Without Reduction.		With Reduction.		Without Reduction.		With Reduction.		Without Reduction.		With Reduction.	
	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.
7.00	24 76.2	+04.3	24 72.7	+00.8	24 75.3	+03.4	24 74.8	+02.9	24 77.7	+05.8	24 76.2	+04.3	24 77.2	+05.3	24 73.7	+01.8	24 73.3	+01.4	24 70.8	-01.1
7.30	24 78.7	+06.8	24 75.2	+03.3	24 78.2	+06.3	24 77.7	+05.8	24 77.2	+05.3	24 74.7	+02.8	24 74.5	+02.6	24 70.5	-01.4	24 74.6	+02.7	24 70.6	-01.3
8.00	24 79.5	+07.6	24 76.0	+04.1	24 78.9	+05.0	24 78.4	+04.5	24 77.5	+05.6	24 75.0	+03.1	24 82.2	+10.3	24 77.7	+05.8	24 73.9	+02.0	24 70.4	-01.5
8.30	24 78.2	+06.3	24 74.7	+02.8	24 78.4	+06.5	24 78.4	+06.5	24 77.7	+05.8	24 75.2	+03.3	24 80.7	+08.8	24 77.2	+05.3	24 75.9	+04.0	24 72.9	+01.0
9.00	24 77.2	+05.3	24 75.2	+03.3	24 74.8	+02.9	24 74.8	+02.9	24 75.6	+03.7	24 73.1	+01.2	24 75.2	+03.3	24 71.7	-00.2	24 73.4	+01.5	24 70.9	-01.0
10.00	24 77.7	+05.8	24 79.2	+07.3	24 71.5	00.4	24 72.0	+00.1	24 74.7	+02.8	24 75.2	+03.3	24 71.4	-00.5	24 71.9	00.0	24 72.8	+00.9	24 72.3	+00.4
11.00	24 72.2	+00.3	24 75.7	+03.8	24 71.9	00.0	24 74.4	+02.5	24 72.8	+00.9	24 76.3	+04.4	24 70.2	-01.7	24 74.7	+02.8	24 69.5	-02.4	24 71.0	-00.9
11.30	24 73.1	+01.2	24 77.6	+05.7	24 72.3	+00.4	24 75.8	+03.9	24 72.2	+00.3	24 75.7	+03.8	24 69.8	-02.1	24 75.8	+03.9	24 69.9	-02.0	24 72.9	+01.0
12.30	24 72.2	+00.3	24 76.7	+04.8	24 72.1	+00.2	24 76.6	+04.7	24 70.9	-01.0	24 75.4	+03.5	24 67.5	-04.4	24 72.0	+00.1	24 69.3	-02.6	24 72.3	+00.4
1.00	24 72.5	+00.6	24 76.0	+04.1	24 71.5	+00.4	24 76.0	+04.1	24 68.3	-03.6	24 72.8	+00.9	24 67.0	-04.9	24 71.0	-00.9	24 70.9	-01.0	24 73.4	+01.5
1.30	24 73.5	+01.6	24 76.5	+04.6	24 72.3	+00.4	24 76.8	+04.9	24 70.2	-01.7	24 73.7	+01.8	24 70.0	-01.9	24 73.0	+01.1	24 70.1	-01.8	24 72.1	+00.2
2.00	24 74.1	+02.2	24 76.6	+04.7	24 72.1	+00.2	24 75.1	+03.2	24 69.9	-02.0	24 72.9	+01.0	24 69.0	-02.9	24 72.0	+00.1	24 70.9	-01.0	24 72.4	+00.5
2.30	24 74.2	+02.8	24 74.7	+02.8	24 72.7	+00.3	24 74.2	+02.3	24 71.1	-00.8	24 74.1	+02.1	24 65.1	-06.8	24 68.1	-03.8	24 70.3	-01.6	24 71.3	-00.6
3.00	24 76.0	+04.1	24 75.5	+03.6	24 73.0	+01.1	24 73.5	+01.6	24 71.5	-00.4	24 74.0	+02.1	24 68.3	-03.6	24 70.8	-01.1	24 69.4	-02.5	24 70.9	-01.0
4.00	24 77.4	+05.5	24 76.9	+05.0	24 73.0	+01.1	24 72.5	+00.6	24 70.7	-01.2	24 71.2	-00.7	24 65.7	-06.2	24 68.2	-03.7	24 68.9	-03.0	24 69.4	-02.5
4.30	24 76.0	+04.1	24 75.5	+03.6	24 72.1	+00.2	24 71.6	-00.3	24 71.2	-00.7	24 71.7	-00.2	24 68.0	-03.9	24 70.5	-01.4	24 66.2	-05.7	24 66.7	-05.2



TABLE No. II—Continued.

COMPARISON of the Magnetic Declination at Rosthern, Sask., as obtained without any Reduction, &c.—Continued.

Time.	NOVEMBER 7.				NOVEMBER 8.				NOVEMBER 9.				NOVEMBER 10.				NOVEMBER 11.			
	Without Reduction.		With Reduction.		Without Reduction.		With Reduction.		Without Reduction.		With Reduction.		Without Reduction.		With Reduction.		Without Reduction.		With Reduction.	
	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.
7.00	24 75 6	+03.7	24 75 1	+03.2	24 75 0	+03.1	24 75 0	+03.1	24 72 9	+01.0	24 72 9	+01.0	24 65 6	-06.3	24 63 1	-08.8	24 72 6	+00.7	24 70 6	-01.3
7.30	24 77 1	+05.2	24 74 1	+02.2	24 75 1	+03.5	24 74 1	+03.5	24 75 2	+03.3	24 75 2	+03.3	24 65 7	-06.2	24 65 2	-06.7	24 74 9	+03.0	24 72 9	+01.0
8.00	24 78 4	+06.5	24 75 9	+04.0	24 74 8	+02.9	24 74 8	+02.9	24 76 7	-05.2	24 76 7	-05.2	24 74 0	+02.1	24 73 5	+01.6	24 74 1	+02.2	24 71 6	-00.3
8.30	24 76 9	+05.0	24 72 9	+01.0	24 69 4	-02.5	24 69 4	-02.5	24 76 8	-05.1	24 76 8	-05.1	24 74 8	+02.9	24 73 3	+01.4	24 72 2	+04.3	24 72 7	+00.8
9.00	24 73 7	+01.8	24 69 2	-02.7	24 73 5	+01.6	24 73 5	+01.6	24 74 9	+03.0	24 74 9	+03.0	24 75 8	+03.9	24 76 3	+04.4	24 72 9	+01.0	24 69 4	-02.5
10.00	24 75 1	+03.2	24 73 6	+01.7	24 73 8	+01.9	24 73 8	+01.9	24 76 8	+04.9	24 76 8	+04.9	24 73 7	+01.8	24 72 7	+00.8	24 75 0	+03.1	24 73 5	+01.6
11.00	24 73 5	+01.6	24 76 0	+04.1	24 72 5	+00.6	24 72 5	+00.6	24 71 7	-00.2	24 71 7	-00.2	24 73 7	+01.8	24 73 2	+01.3	24 72 1	+00.2	24 71 6	-00.3
11.30	24 71 6	-00.3	24 75 1	+03.2	24 69 8	-02.1	24 69 8	-02.1	24 73 8	+01.9	24 73 8	+01.9	24 72 0	+00.1	24 72 5	+00.6	24 69 3	-02.6	24 69 8	-02.1
12.30	24 68 7	-03.2	24 74 2	+02.3	24 63 6	-08.3	24 63 6	-08.3	24 66 8	-05.1	24 66 8	-05.1	24 69 5	-02.4	24 72 0	+00.1	24 68 1	-03.8	24 71 1	-00.8
1.00	24 68 0	-03.9	24 73 5	+01.6	24 66 1	-05.8	24 66 1	-05.8	24 67 7	-06.7	24 67 7	-06.7	24 69 9	-04.0	24 70 4	-01.5	24 67 6	-04.3	24 72 1	+00.2
1.30	24 68 0	-03.9	24 74 0	+02.1	24 69 8	-02.1	24 69 8	-02.1	24 67 7	-04.2	24 67 7	-04.2	24 66 0	-03.9	24 68 5	-03.4	24 68 3	-03.6	24 72 8	+00.9
2.00	24 69 9	-02.0	24 74 4	+02.5	24 65 9	-06.0	24 65 9	-06.0	24 64 9	-07.0	24 64 9	-07.0	24 70 9	-01.0	24 68 5	-03.4	24 68 3	-03.6	24 72 8	+00.9
2.30	24 69 1	-02.8	24 71 6	-00.3	24 64 6	-07.3	24 64 6	-07.3	24 65 9	-06.0	24 65 9	-06.0	24 69 8	-02.1	24 68 5	-03.4	24 68 3	-03.6	24 72 8	+00.9
3.00	24 70 1	-01.8	24 72 6	+00.7	24 72 8	+00.9	24 72 8	+00.9	24 73 0	+01.1	24 73 0	+01.1	24 72 2	+00.3	24 69 6	-02.3	24 69 6	-02.3	24 73 1	+01.2
4.00	24 70 4	-01.5	24 70 9	-01.0	24 66 5	-05.4	24 66 5	-05.4	24 71 7	-00.2	24 71 7	-00.2	24 72 2	+00.3	24 69 6	-02.3	24 70 3	-01.6	24 70 8	-01.1
4.30	24 66 8	-05.1	24 68 3	-03.6	24 71 1	-00.8	24 71 1	-00.8	24 69 8	-02.1	24 69 8	-02.1	24 79 4	+07.5	24 69 8	-02.1	24 70 4	-01.5	24 70 9	-01.0



TABLE No. II—Continued.

COMPARISON of the Magnetic Declination at Rosthern, Sask., as obtained without any Reduction, &c.—Continued.

Time.	NOVEMBER 12.				NOVEMBER 14.				NOVEMBER 15.				NOVEMBER 16.				NOVEMBER 17.			
	Without Reduction.		With Reduction.		Without Reduction.		With Reduction.		Without Reduction.		With Reduction.		Without Reduction.		With Reduction.		Without Reduction.		With Reduction.	
	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.
7.00	24 72.2	+00.3	24 69.7	-02.2	24 76.0	+04.1	24 72.5	+00.6	24 74.9	+03.0	24 72.4	+00.5	24 74.6	+02.7	24 73.6	+01.7	24 69.8	-02.1	24 73.6	+01.7
7.30	24 73.6	+01.7	24 71.1	-00.8	24 75.4	+03.5	24 71.9	00.0	24 73.8	+01.9	24 71.3	-00.6	24 64.0	-07.9	24 63.0	-08.9	24 72.8	+00.9	24 63.0	-08.9
8.00	24 73.7	+01.8	24 71.2	-00.7	24 75.1	+03.2	24 71.6	-00.3	24 72.5	+00.6	24 69.0	-02.9	24 69.1	-02.8	24 68.1	-03.8	24 68.3	-03.6	24 68.1	-03.8
8.30	24 74.2	+02.3	24 70.7	-01.2	24 71.5	-00.4	24 68.0	-03.9	24 74.7	+02.8	24 72.2	+00.3	24 75.8	+03.9	24 75.3	+03.4	24 67.5	-04.4	24 75.3	+03.4
9.00	24 73.9	+02.0	24 70.9	-01.0	24 72.0	+00.3	24 68.5	-03.4	24 74.5	+02.6	24 73.0	+01.1	24 74.7	+02.8	24 75.2	+03.3	24 68.4	-03.5	24 75.2	+03.3
10.00	24 72.9	+01.0	24 70.4	-01.5	24 72.6	+00.7	24 70.1	-01.8	24 71.5	-00.4	24 71.0	-00.9	24 75.8	+03.9	24 74.3	+02.4	24 73.0	+01.1	24 74.3	+02.4
11.00	24 70.3	-01.6	24 71.3	-00.6	24 67.8	-04.1	24 70.8	-01.1	24 69.7	-02.2	24 71.7	-00.2	24 73.1	+01.2	24 73.6	+01.7	24 70.3	-01.6	24 73.6	+01.7
11.30	24 68.7	-03.2	24 71.2	-00.7	24 69.1	-02.8	24 71.6	-00.3	24 68.5	-03.4	24 71.0	-00.9	24 72.4	+00.5	24 73.9	+02.0	24 69.9	-02.0	24 73.9	+02.0
12.30	24 68.3	-03.6	24 71.8	-00.1	24 66.7	-05.2	24 71.2	-00.7	24 67.1	-04.8	24 71.6	-00.3	24 67.8	-04.1	24 71.3	-00.6	24 67.0	-04.9	24 71.3	-00.6
1.00	24 69.2	-02.7	24 74.7	+02.8	24 66.0	-05.9	24 70.0	-01.9	24 66.0	-05.9	24 71.5	-00.4	24 71.3	-00.6	24 74.8	+02.9	24 68.7	-03.2	24 74.8	+02.9
1.30	24 69.2	-02.7	24 74.7	+02.8	24 66.3	-05.6	24 69.8	-02.1	24 67.1	-04.8	24 72.1	+00.2	24 70.4	-01.5	24 73.4	+01.5	24 68.9	-03.0	24 73.4	+01.5
2.00	24 70.8	-01.1	24 75.3	+03.4	24 68.9	-03.0	24 72.4	+00.5	24 74.3	-07.6	24 68.8	-03.1	24 70.1	-01.8	24 72.6	+00.7	24 68.7	-03.2	24 72.6	+00.7
2.30	24 67.1	-04.8	24 70.6	-01.3	24 69.4	-02.5	24 72.9	+01.0	24 70.2	-01.7	24 74.2	+02.3	24 72.0	+00.1	24 65.0	-06.9	24 72.2	+00.3	24 72.0	+00.1
3.00	24 68.4	-03.5	24 70.9	-01.0	24 70.6	-01.3	24 74.1	+02.2	24 69.0	-02.9	24 72.0	+00.1	24 72.0	+00.1	24 74.0	+02.1	24 66.6	-05.3	24 72.0	+00.1
4.00	24 69.3	-02.6	24 71.3	-00.6	24 70.0	-01.9	24 70.5	-01.4	24 69.1	-02.8	24 71.1	-00.8	24 68.3	-03.6	24 69.8	-02.1	24 69.8	-02.1	24 69.8	-02.1
4.30	24 69.7	-02.2	24 71.2	-00.7	24 68.9	-03.0	24 69.4	-02.5	24 70.9	-01.0	24 72.4	+00.5	24 72.1	+00.2	24 74.6	+02.7	24 67.7	-04.2	24 74.6	+02.7



SESSIONAL PAPER No. 25b

TABLE No. II.—Continued.  
COMPARISON of the Magnetic Declination at Rosthern, Sask., as obtained without any Reduction, &c.—Continued.

Time.	NOVEMBER 18.				NOVEMBER 19.				NOVEMBER 21.				NOVEMBER 22.				NOVEMBER 23.			
	Without Reduction.		With Reduction.		Without Reduction.		With Reduction.		Without Reduction.		With Reduction.		Without Reduction.		With Reduction.		Without Reduction.		With Reduction.	
	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.
7.00	24 55.7	-16.2	.....	.....	24 57.2	-14.7	.....	.....	24 71.4	-00.5	24 69.9	-02.0	24 72.5	+00.6	24 77.0	+05.1	24 75.3	+03.4	24 72.8	+00.9
7.30	24 66.2	-02.7	.....	.....	24 59.5	-12.4	.....	.....	24 71.0	+00.6	24 71.0	-00.9	24 72.5	+00.3	24 70.7	-01.2	24 75.1	+03.2	24 72.6	+00.7
8.00	24 66.2	-03.7	.....	.....	24 57.1	-14.8	.....	.....	24 69.7	-02.2	24 69.7	-02.2	24 72.2	+00.3	24 70.7	-01.2	24 75.1	+03.2	24 72.6	+00.7
8.30	24 55.1	-16.8	.....	.....	24 52.9	-19.0	.....	.....	24 69.5	-02.4	24 69.5	-02.4	24 72.0	+00.1	24 67.5	-04.4	24 75.1	+03.4	24 72.8	+00.9
9.00	24 59.2	-12.7	.....	.....	24 58.3	-13.6	.....	.....	24 71.2	-00.7	24 71.2	-00.7	24 74.2	+02.3	24 72.7	+00.8	24 75.3	+03.4	24 72.8	+00.9
9.30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10.00	24 64.7	-07.2	.....	.....	24 70.5	-01.4	.....	.....	24 64.0	-07.9	24 64.0	-07.9	24 70.3	-01.6	24 69.8	-02.1	24 74.6	+02.7	24 74.1	+02.2
11.00	24 64.4	-07.5	.....	.....	24 52.3	-19.6	.....	.....	24 67.2	-04.2	24 67.2	-04.2	24 64.4	-07.5	24 64.9	-07.0	24 71.8	-00.1	24 73.3	+01.4
11.30	24 59.2	-12.7	.....	.....	24 49.0	-22.9	.....	.....	24 69.8	-02.1	24 69.8	-02.1	24 63.2	-08.7	24 66.7	-05.2	24 69.6	-02.3	24 73.6	+01.7
12.30	24 58.9	-13.0	.....	.....	24 56.2	-15.7	.....	.....	24 72.6	+00.7	24 72.6	+00.7	24 68.9	-03.0	24 76.4	+04.5	24 64.5	-07.4	24 70.0	-01.9
1.00	24 63.0	-08.9	.....	.....	24 58.6	-13.3	.....	.....	24 73.4	+01.5	24 73.4	+01.5	24 70.8	-01.1	24 78.8	+06.9	24 66.2	-05.7	24 71.7	-00.2
1.30	24 66.2	-08.7	.....	.....	24 59.2	-12.7	.....	.....	24 71.7	-00.2	24 71.7	-00.2	24 66.2	-05.7	24 71.7	-00.2	24 69.1	-02.8	24 74.6	+02.7
2.00	24 65.8	-06.1	.....	.....	24 62.0	-09.9	.....	.....	24 75.0	-00.9	24 75.0	-00.9	24 61.0	-10.9	24 65.5	-06.4	24 67.9	-04.0	24 72.9	+01.0
2.30	24 76.3	+04.4	.....	.....	24 64.1	-07.8	.....	.....	24 75.5	+03.6	24 75.5	+03.6	24 70.8	-01.1	24 74.8	+02.9	24 64.3	-07.6	24 68.8	-03.1
3.00	24 68.2	-03.7	.....	.....	24 65.2	-06.7	.....	.....	24 73.1	+01.2	24 73.1	+01.2	24 69.3	-02.6	24 72.3	+00.4	24 65.8	-06.1	24 69.3	-02.6
4.00	24 67.9	-04.0	.....	.....	24 68.6	-03.3	.....	.....	24 71.5	-00.4	24 71.5	-00.4	24 71.6	-00.3	24 75.1	+03.2	24 67.7	-04.2	24 70.2	-01.7
4.30	24 67.2	-04.7	.....	.....	24 69.9	-02.0	.....	.....	24 70.9	-01.0	24 70.9	-01.0	24 71.7	-00.7	24 73.7	+01.8	24 70.9	-01.0	24 74.4	+02.5



TABLE No. II—Continued.

COMPARISON of the Magnetic Declination at Rosthern, Sask., as obtained without any Reduction, &c.—Continued.

Time.	NOVEMBER 24.				NOVEMBER 25.				NOVEMBER 26.				NOVEMBER 27.				NOVEMBER 28.			
	Without Reduction.		With Reduction.		Without Reduction.		With Reduction.		Without Reduction.		With Reduction.		Without Reduction.		With Reduction.		Without Reduction.		With Reduction.	
	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.
	o	'	o	'	o	'	o	'	o	'	o	'	o	'	o	'	o	'	o	'
7.30	24 74.4	+02.5	24 71.4	-00.5	24 75.1	+03.4	24 73.3	+01.4	24 77.8	+05.9	24 80.8	+08.9	24 72.9	+01.0	24 71.9	00.0	24 71.8	-00.1		
8.00	24 74.6	+02.7	24 72.1	+00.2	24 72.1	+00.2	24 68.6	-03.3	24 77.5	+05.6	24 77.0	+05.1	24 68.0	-03.9	24 67.5	-04.4	24 72.1	+00.2		
8.30	24 73.7	+01.8	24 70.2	-01.7	24 75.9	+04.0	24 73.4	+01.5	24 76.5	+04.6	24 75.0	+03.1	24 67.3	-04.6	24 64.8	-07.1	24 56.5	-15.4		
9.00	24 73.5	+01.6	24 70.0	-01.9	24 75.8	+03.9	24 73.8	+01.9	24 76.4	+04.5	24 72.9	+01.0	24 68.1	-03.8	24 65.6	-06.3	24 68.5	-03.4		
9.30	24 72.2	+00.3	24 69.7	-02.2	24 77.0	+05.1	24 75.5	+03.6												
10.00	24 69.6	-02.3	24 68.1	-03.8	24 73.5	+01.6	24 75.0	+08.1	24 74.7	+02.8	24 73.2	+01.3	24 69.1	-02.8	24 69.6	-02.3	24 66.3	-05.6		
11.00	24 64.8	-07.1	24 67.8	-04.1	24 67.8	-04.1	24 69.8	-02.1	24 70.0	-01.9	24 71.5	-00.4	24 67.2	-04.7	24 71.7	-00.2	24 58.8	-13.1		
11.30	24 65.2	-06.7	24 70.2	-01.7	24 65.5	-06.4	24 69.0	-02.9									24 64.8	-07.1		
12.30	24 69.2	-02.7	24 76.7	+05.8	24 65.5	-06.4	24 69.0	-02.9	24 68.6	-03.3	24 72.1	+00.2	24 66.9	-05.0	24 70.4	-01.5	24 67.9	-04.0		
1.00	24 70.2	-01.7	24 77.7	+04.4	24 64.0	-07.9	24 71.9	00.0	24 69.5	-02.4	24 73.0	+01.1	24 67.4	-04.5	24 70.9	-01.0	24 69.2	-02.7		
1.30	24 68.8	-03.1	24 76.3	+04.4	24 64.0	-07.9	24 68.5	-03.4									24 67.3	-04.0		
2.00	24 63.2	-08.7	24 69.2	-02.7	24 63.1	-08.8	24 67.6	-04.3	24 70.2	-01.7	24 74.2	+02.3	24 66.4	-05.5	24 66.9	-05.0	24 58.1	-13.8		
2.30	24 69.3	-02.6	24 74.8	+02.9	24 69.9	-02.0	24 73.4	+01.5	24 69.7	-02.2	24 73.2	+01.3	24 68.4	-03.5	24 67.9	-04.0	24 64.6	-07.3		
3.00	24 70.6	-01.3	24 74.1	+02.2	24 67.5	-02.4	24 72.0	+00.1	24 70.7	-01.2	24 73.2	+01.3	24 68.7	-03.2	24 71.2	-00.7	24 65.0	-06.9		
4.00	24 69.7	-02.2	24 71.7	-00.2	24 66.2	-05.7	24 70.2	-01.7	24 71.1	-00.8	24 73.1	+01.2	24 67.8	-04.1	24 70.3	-01.6	24 63.2	-08.7		



TABLE No. II.—*Concluded.*  
COMPARISON of the Magnetic Declination at Rosthern, Sask., as obtained without any Reduction, &c.—*Concluded.*

Time.	NOVEMBER 29.				NOVEMBER 30.			
	Without Reduction.		With Reduction.		Without Reduction.		With Reduction.	
	Decl.	v.	Decl.	v.	Decl.	v.	Decl.	v.
7.30	24 74.5	+02.6	.....	.....	24 77.9	+05.0	24 77.4	+05.5
8.00	24 57.5	-14.4	.....	.....	24 72.6	+00.7	24 70.6	-01.3
8.30	24 51.4	-20.5	.....	.....	24 77.4	+05.5	24 74.9	+03.0
9.00	24 58.2	-13.7	.....	.....	24 75.9	+04.0	24 73.4	+01.5
9.30	24 58.1	-13.8	.....	.....	24 74.4	+02.5	24 72.4	+00.5
10.00	24 60.7	-11.2	.....	.....	24 73.0	+01.1	24 71.5	-00.4
11.00	24 59.9	-12.0	.....	.....	24 68.5	-03.4	24 68.0	-03.9
11.30	24 58.0	-13.9	.....	.....	24 70.8	-01.1	24 72.8	+00.9
12.30	24 67.1	-04.8	.....	.....	24 67.5	-01.4	24 71.0	-00.9
1.00	24 68.9	-03.0	.....	.....	24 63.0	-08.9	24 65.5	-06.4
1.30	24 76.1	+04.2	.....	.....	24 66.1	-05.8	24 70.6	-01.3
2.00	24 68.0	-03.9	.....	.....	24 66.1	-05.8	24 70.6	-01.3
2.30	24 65.1	-06.8	.....	.....	24 66.0	-05.9	24 71.5	-00.4
3.00	24 62.0	-09.9	.....	.....	24 67.5	-04.4	24 73.5	+01.6
4.00	24 62.4	-09.5	.....	.....	.....	.....	.....	.....

Mean Declination for November ..... 24° 71' 9  
 Without Reduction.      With Reduction.  
 Maximum Residual ..... 22' 9      8' 9  
 Mean Residual .....      2' 2



TABLE No. 3.

Place.	Tp.	Rge.	Mer.	Date.	Time.	Dip.	Time.	Total Intensity.	Observer.
40° 00' W. 10° 00' S.—N.E. cor. sec. 18.	40	22	3	14-10-10	9.03 A	77	9.30 A	9.79763	D. E. Chartrand.
" " " " " "	40	22	3	14-10-10	9.58 A	77	10.25 A	9.79777	
10° 00' S. 15° 00' E.— $\frac{1}{4}$ p. W. by 31.	37	24	3	23-10-10	1.57 P	77	2.27 P	9.79601	
" " " " " "	37	24	3	23-10-10	2.54 P	77	3.19 P	9.79632	
5° 00' S.— $\frac{1}{4}$ p. E. by sec. 9.	21	4	2	15-6-10	3.30 P	77	4.10 P	9.80050	
" " " " " "	21	4	2	15-6-10	4.45 P	77	5.25 P	9.80047	
" " " " " "	21	4	2	15-6-10	5.57 P	77	41° 5	.....	
" " " " " "	21	4	2	19-6-10	10.07 A	77	9.30 A	9.80055	
" " " " " "	21	4	2	19-6-10	10.47 A	77	10.40 A	9.80052	
" " " " " "	21	4	2	19-6-10	11.15 A	77	.....	.....	
30° 00' W. 10° 00' S.—N.E. cor. sec. 3.	35	1	3	31-7-10	9.18 A	77	9.51 A	9.80269	
20° 00' S. 3° 00' E.— " 12.	34	3	3	3-8-10	1.45 P	77	2.27 P	9.80184	
" " " " " "	34	3	3	3-8-10	3.07 P	77	3.35 P	9.80181	
22° 00' N. 35° 00' W.—S.E. cor. sec. 9.	33	4	3	10-8-10	2.24 P	77	3.09 P	9.80057	
15° 00' N. 14° 00' W.—N.E. " 36.	38	5	3	12-8-10	2.21 P	77	2.56 P	9.79928	
" " " " " "	38	5	3	12-8-10	3.34 P	77	52° 1	9.79937	
At N.E. cor. sec. 29	22	6	2	9-6-10	2.46 P	77	4.09 P	9.79976	
" " " " " "	22	6	2	9-6-10	4.24 P	77	3.39 P	9.79976	
" " " " " "	22	6	2	9-6-10	5.24 P	77	4.54 P	9.80018	
" " " " " "	22	6	2	12-6-10	9.49 A	77	10.36 A	9.80005	
" " " " " "	22	6	2	12-6-10	11.16 A	77	11.54 A	9.80049	
22° 00' N. 35° 00' W.—S.E. cor. sec. 9	33	4	3	9-10-10	12.24 P	77	.....	.....	
" " " " " "	33	4	3	9-10-10	9.39 A	77	10.06 A	9.80005	
5° 00' N. 25° 00' W.—N.E. cor. sec. 22.	32	16	2	17-7-10	10.39 A	77	11.09 A	9.80006	
" " " " " "	32	16	2	17-7-10	9.25 A	78	10.00 A	9.80178	
" " " " " "	32	16	2	17-7-10	10.28 A	78	10.58 A	9.80098	
10° 00' W.—Centre sec. 36.	32	20	2	27-7-10	11.30 A	78	.....	.....	
30° 00' W.—N.E. cor. sec. 3.	35	1	3	30-7-10	7.13 P	78	7.43 P	9.80143	
" " " " " "	35	1	3	30-7-10	4.36 P	77	5.01 P	9.80312	
" " " " " "	35	1	3	30-7-10	5.31 P	77	5.53 P	9.80337	
At N.E. cor. sec. 8.	35	1	3	30-7-10	6.36 P	77	.....	.....	
" " " " " "	26	12	2	6-7-10	2.15 P	77	2.47 P	9.80046	
" " " " " "	26	12	2	6-7-10	3.20 P	77	4.00 P	9.80029	
3° 00' E. of N.E. cor. sec. 22.	33	22	2	6-7-10	4.30 P	77	.....	.....	
" " " " " "	33	22	2	16-7-10	1.30 P	78	2.02 P	9.80131	
" " " " " "	33	22	2	16-7-10	2.30 P	78	2.55 P	9.80082	
20° 00' N.—N.E. cor. sec. 17.	36	27	Pr.	16-7-10	3.25 P	78	.....	.....	
" " " " " "	36	27	Pr.	31-5-10	3.03 P	79	3.52 P	9.80566	
" " " " " "	36	27	Pr.	31-5-10	4.47 P	79	.....	.....	
" " " " " "	36	27	Pr.	1-6-10	9.25 A	79	10.17 A	9.80531	



## SESSIONAL PAPER No. 25b

5° 00' N. 15° 00' E.— $\frac{1}{4}$ E. by 29.	36	27	Pr.	1-6-10	11.00 A	79 10.3	1.42 P	9 80560	"
"	36	27	Pr.	3-6-10	2.25 P	79 05.9	2.57 P	9 80564	"
"	36	27	Pr.	3-6-10	3.32 P	79 06.1			"
20° 00' S.—S. E. cor. sec. 5.	45	21	2	1-9-10	10.35 A	79 01.3	10.00 A	9 77947	"
"	45	21	2	1-9-10	10.35 A	79 04.3	2.32 P	9 77929	"
20° 00' S.—S. E. cor. sec. 5.	49	26	2	3-9-10	1.57 P	79 13.5	3.30 P	9 80196	"
At $\frac{1}{4}$ post W. by sec. 30.	43	16	3	12-9-10	11.24 A	77 42.3	12.00 M	9 79765	"
At $\frac{1}{4}$ post W. by sec. 30.	43	16	3	12-9-10	12.32 P	77 43.3	1.12 P	9 79763	D. E. Chartrand.
20° 00' S.—N. W. cor. sec. 7.	45	18	2	6-10-10	10.54 A	79 03.2	10.22 A	9 80032	"
"	45	18	2	6-10-10	10.54 A	79 03.5	11.27 A	9 80075	"
15° 00' W.—N. E. cor. sec. 18.	48	25	3	25-9-10	9.36 A	78 18.5	10.11 A	9 79757	"
"	48	25	3	25-9-10	10.48 A	78 20.2	11.26 A	9 79756	"
10° 00' S. 10° 00' E.— $\frac{1}{4}$ P. W. by 6.	39	2	3	25-9-10	8.10 A	78 15.2	8.40 A	9 80204	"
20° 00' S.—S. E. cor. sec. 5.	49	26	2	29-9-10	9.12 A	78 14.8	9.52 A	9 80303	"
"	49	26	2	1-10-10	10.07 A	79 13.3	10.37 A	9 80241	"
10° 00' S. 5° 00' E.—N. E. cor. 19.	37	22	2	1-10-10	11.09 A	79 15.3	11.39 A	9 80205	"
"	37	22	2	18-8-10	8.45 A	78 28.7	9.20 A	9 80135	"
30° 00' S. 5° 00' E.—N. E. cor. 34.	42	3	3	18-8-10	9.52 A	78 29.6	10.25 A	9 80138	"
"	42	3	3	23-8-10	8.25 A	78 14.6	9.02 A	9 80410	"
At N. E. cor. sec. 12.	49	4	3	23-8-10	9.47 A	78 15.3	10.27 A	9 80391	"
"	49	4	3	27-8-10	9.44 A	78 45.1	10.24 A	9 79879	"
Churchill East Peninsula—Lat. 58° 47' 34", long. 94° 10' 00".	49	4	3	27-8-10	10.59 A	78 45.4	11.31 A	9 79909	J. E. Morrier.
"	49	4	3	23-8-08	11.48 A	84 38.0	12.44 P	9 80441	"
Churchill West Peninsula—Lat. 58° 46' 47", long. 94° 11' 00".	49	4	3	23-8-08	3.11 P	84 36.8	11.32 A	9 80323	"
"	49	4	3	30-8-08	11.32 A	84 41.3	12.34 P	9 80341	"
"	49	4	3	30-8-08	3.48 P	84 34.1	4.27 P	9 80623	"
H. B. Post, Norway House—Lat. 53° 58' 00", long. 97° 52' 00".	66	22	4	22-9-08	10.55 A	84 33.5	11.55 A	9 80623	"
H. B. Post, Norway House—Lat. 53° 58' 00", long. 97° 52' 00".	66	22	4	22-9-08	2.05 P	84 35.1	2.50 P	9 80401	"
H. B. Post, Oxford House—Lat. 54° 53' 30", long. 95° 45' 00".	66	22	4	1-11-08	11.20 A	84 35.4	12.17 P	9 80609	"
H. B. Post, York Factory—Lat. 57° 00' 00", long. 92° 23' 00".	66	22	4	1-11-08	1.00 P	84 36.9	1.36 P	9 80634	"
"	66	22	4	18-6-08	10.44 A	80 58.9	12.01 P	9 80634	"
"	66	22	4	18-6-08	1.35 P	80 58.2	2.28 P	9 80461	"
"	66	22	4	21-6-08	10.14 A	80 58.0	11.14 A	9 80541	"
"	66	22	4	21-6-08	1.38 P	80 57.1	2.22 P	9 80603	"
"	66	22	4	27-6-08	12.12 P	82 31.6	12.57 P	9 80765	"
"	66	22	4	27-6-08	2.19 P	82 31.9	2.54 P	9 80681	"
"	66	22	4	7-7-08	4.48 P	83 32.9	5.35 P	9 80095	"
"	66	22	4	8-7-08	9.52 A	83 27.4	10.24 A	9 80218	"
"	66	22	4	8-7-08	2.24 P	83 27.0			"
"	66	22	4	8-7-08	5.20 P	83 30.9	5.57 P	9 80208	"
"	66	22	4	10-7-08	9.04 A	83 27.5	9.46 A	9 80304	"
71° 11' N. 71° 01' E.—N. E. cor. sec. 7.	84	17	4	19-7-08	10.40 A	83 36.3	11.12 A	9 80072	Carl Ingler.
"	84	17	4	19-5-10	10.40 A	78 04.5	11.24 A	9 79341	"
"	84	17	4	19-5-10	12.10 P	78 03.1			"
"	84	17	4	20-5-10	2.32 P	78 04.3	3.27 P	9 79335	"
"	84	17	4	20-5-10	3.44 P	78 00.6			"
Grand Rapids, Athabaska River.	84	17	4	31-5-10	10.01 A	79 28.5	11.18 A	9 79420	J. A. Cote.
"	84	17	4	31-5-10	12.42 P	79 28.6			"



TABLE No. 3—*Concluded.*

Place.	Tp.	Rge.	Mer.	Date.	Time.	Dip.	Time.	Total Intensity.	Observer.
"	84	17	4	1-6-10	9 30 A	79 27.3	10.21 A	9.79891	Carl Engler.
"	84	17	4	1-6-10	11.06 A	79 26.8			"
Below Boiler Rapids, Athabaska River.				5-6-10	5.37 P	79 31.2	6.32 P	9.79874	"
Big Cascade, Athabaska R.				7-6-10	4.22 P	79 30.1	5.00 P	9.79499	J. A. Cote.
"				7-6-10	5.32 P	79 42.9			"
Fort McMurray, S. Shore Athabaska R., opp. island.				10-6-10	3.22 P	79 58.1	4.00 P	9.79727	"
"				10-6-10	4.24 P	79 57.7			Carl Engler.
"				13-6-10	2.11 P	80 00.1	3.00 P	9.79634	"
"				13-6-10	3.39 P	79 58.1			J. A. Cote.
Fort Chipewyan.				17-6-10	3.33 P	81 08.2	4.03 P	9.79649	"
Smith Landing, S. W. cor. H. E. Co. Res.				23-6-10	3.42 P	81 55.0	4.20 P	9.81617	"
"				23-6-10	4.54 P	81 49.4			Carl Engler.
Ft. Smith, near Obs'g Tent.				11-7-10	4.20 P	81 57.3	5.05 P	9.79420	J. A. Cote.
"				12-7-10	3.27 P	81 57.9	4.16 P	9.79346	"
"				12-7-10	4.55 P	81 59.0			"
Fort Chipewyan.				6-8-10	10.43 A	81 09.7	12.24 P	9.79512	Carl Engler.
"				6-8-10	1.20 P	81 09.2			"
Ft. McMurray, Point of Mag. Obs'ns.				10-8-10	9.19 A	80 02.8	10.09 A	9.79621	"
"				10-8-10	10.49 A	80 00.1			"
Grand Rapids, E. shore of river.				24-8-10	10.15 A	79 28.5	10.52 A	9.79333	"
"				24-8-10	11.22 A	79 29.6			"



SESSIONAL PAPER No. 25b

TABLE No. 4.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912 '0	
At $\frac{1}{4}$ sec. cor. E. by sec. 36.....	19	1	Pr.	1910.4	12 28.5	12 33.4	P.R.A. Belanger.
11.00 N.—N.E. cor. sec. 12.....	29	1	"	1910.5	12 53.8	12 57.6	E. W. Robinson.
60.00 N.—" 12.....	29	1	"	1910.5	12 47.2	12 52.0	" "
49.00 N.—" 1.....	30	1	"	1910.6	13 05.1	13 10.6	" "
30.00 N.—" 24.....	30	1	"	1910.6	13 02.7	13 08.2	" "
28.00 W.—" 31.....	32	1	"	1910.8	13 43.5	13 46.0	" "
59.00 W.—" 7.....	33	1	"	1910.8	13 43.9	13 43.4	" "
10.00 N.—" 36.....	33	1	"	1910.8	12 22.7		" "
15.00 N.—" 1.....	34	1	"	1910.8	13 37.2		" "
20.00 N.—" 24.....	34	1	"	1910.8	13 45.7	13 49.2	" "
20.00 N.—" 24.....	34	1	"	1910.8	13 46.3	13 49.8	" "
7.00 N.—" 1.....	35	1	"	1910.8	13 46.0	13 47.5	" "
11.00 N.—" 13.....	35	1	"	1910.8	13 46.7	13 47.2	" "
1.52 N.— $\frac{1}{4}$ cor. E. by sec. 36.....	35	1	"	1911.2	14 46.6	14 47.7	A. W. Ponton.
1.52 N.— $\frac{1}{4}$ " 36.....	35	1	"	1911.2	14 49.9	14 52.0	" "
26.88 N.— $\frac{1}{4}$ " 24.....	36	1	"	1911.2	13 11.5	13 12.6	" "
33.00 N.—N.E. cor. sec. 36.....	37	1	"	1911.2	13 09.6	13 10.7	" "
33.00 N.—" 36.....	37	1	"	1911.2	13 04.6	13 05.7	" "
63.00 N.—" 36.....	37	1	"	1911.2	13 31.6	13 27.2	" "
63.00 N.—" 36.....	37	1	"	1911.2	13 31.8	13 27.4	" "
31.00 N.—" 13.....	38	1	"	1911.2	11 41.2	11 45.3	" "
31.00 N.—" 13.....	38	1	"	1911.2	11 39.4	11 43.5	" "
30.00 N.—" 36.....	38	1	"	1911.2	13 08.7	13 12.8	" "
57.00 N.—" 36.....	39	1	"	1911.2	12 54.5		" "
57.00 N.—" 36.....	39	1	"	1911.2	12 50.6		" "
23.00 N.—" 1.....	41	1	"	1911.2	12 51.5	12 51.6	" "
23.00 N.—" 1.....	41	1	"	1911.2	12 49.3	12 52.4	" "
1.00 N.—" 36.....	41	1	"	1911.2	12 41.4	12 44.5	" "
59.00 N.—" 13.....	42	1	"	1911.2	12 52.7		" "
59.00 N.—" 13.....	42	1	"	1911.2	12 55.8	12 57.9	" "
56.00 N.—" 24.....	43	1	"	1911.2	13 16.9	13 13.0	" "
14.00 N.—" 12.....	44	1	"	1911.2	13 50.7	13 47.3	" "
8.00 N.—" 1.....	46	1	"	1911.2	14 03.8	14 03.9	" "
11.00 N.— $\frac{1}{4}$ cor. E. by 36.....	48	1	"	1911.3	13 05.2	13 09.6	" "
11.00 N.— $\frac{1}{4}$ " 36.....	48	1	"	1911.3	13 04.1	13 05.5	" "
63.62 N.—N.E. cor. sec. 13.....	51	1	"	1911.5	13 15.9	13 17.1	" "
49.40 N.—" 36.....	51	1	"	1911.5	13 42.3	13 42.5	" "
45.00 N.—" 12.....	52	1	"	1911.5	14 48.6	14 47.8	" "
8.00 N.—" 36.....	52	1	"	1911.6	14 09.4	14 09.3	" "
31.04 N.—" 25.....	53	1	"	1911.6	13 31.0	13 29.9	" "
38.27 N.—" 13.....	54	1	"	1911.6	13 38.9	13 37.4	" "
34.75 N.—" 25.....	54	1	"	1911.6	13 31.0	13 29.5	" "
1.64 N.—" 12.....	55	1	"	1911.6	13 44.6	13 42.1	" "
47.63 N.—" 12.....	55	1	"	1911.6	13 36.7	13 36.2	" "
24.00 N.—" 24.....	55	1	"	1911.6	13 16.1	13 13.6	" "
8.45 N.—" 25.....	55	1	"	1911.6	13 50.7	13 51.2	" "
73.82 N.—" 1.....	56	1	"	1911.6	13 37.1	13 33.6	" "
10.67 N.—" 24.....	57	1	"	1911.7	15 14.9	15 11.9	" "
53.77 N.—" 25.....	57	1	"	1911.7	14 38.1	14 34.1	" "
53.77 N.—" 25.....	57	1	"	1911.7	14 33.1	14 30.1	" "
56.54 N.—" 12.....	58	1	"	1911.7	13 21.5	13 16.5	" "
1.00 N.—" 25.....	58	1	"	1911.7	15 00.2	14 56.2	" "
52.52 N.—" 25.....	60	1	"	1911.7	14 25.2	14 25.2	" "
At N.E. cor. sec. 1.....	15	2	"	1910.4	12 36.7		P.R.A. Belanger.
" " 14.....	24	2	"	1910.8	12 58.7	13 05.8	" "
10.00 E.—N.E. cor. sec. 33.....	32	2	"	1910.8	13 31.4	13 34.9	E. W. Robinson.
18.00 W.—" 35.....	18	3	"	1910.4	13 39.3	13 49.2	P.R.A. Belanger.
42.00 S.—" 23.....	26	3	"	1909.9	13 21.4	13 26.4	" "
12.00 E.—" 31.....	32	3	"	1910.8	13 35.3	13 36.8	E. W. Robinson.
32.00 W.—" 35.....	32	3	"	1910.8	12 47.1		" "
10.00 E.— $\frac{1}{4}$ cor. N. by sec. 34.....	20	4	"	1910.4	13 42.8	13 43.9	P.R.A. Belanger.
40.00 S.—N.E. cor. sec. 33.....	27	4	"	1909.9	13 29.8	13 36.8	" "
At N.E. cor. sec. 33.....	32	4	"	1910.8	13 36.1	13 36.6	E. W. Robinson.
$\frac{1}{4}$ sec. cor. E. by sec. 13.....	21	5	"	1912.0	13 17.1	13 14.4	P. B. Street.
10.00 E.—N.E. cor. sec. 35.....	32	5	"	1910.7	14 03.9	14 00.7	E. W. Robinson.
At $\frac{1}{4}$ cor. E. by sec. 36.....	22	6	"	1910.5	13 27.7	13 29.5	P.R.A. Belanger.
30.00 S.—N.E. cor. sec. 11.....	23	6	"	1912.0	12 49.6	12 42.9	P. B. Street.



TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
At N.E. cor. sec. 22.....	26	6	Pr.	1909.9	14 16.9	14 19.5	P.R.A. Belanger.
8.00 W.—N.E. cor. sec. 33.....	32	6	"	1910.7	13 54.7	13 56.1	E. W. Robinson.
21.00 W.—" 36.....	32	6	"	1910.7	13 45.3	"	"
31.00 E.—" 32.....	32	6	"	1910.7	13 51.6	13 52.0	"
20.00 N.—" 20.....	21	7	"	1910.5	13 20.8	13 24.6	P.R.A. Belanger.
At N.E. cor. sec. 22.....	27	7	"	1909.9	13 32.6	13 46.2	"
28.00 S.—N.E. cor. sec. 20.....	32	7	"	1909.4	14 10.5	14 23.4	"
26.00 W.—" 32.....	16	8	"	1909.9	13 46.1	13 44.1	W. J. Deans.
At N.E. cor. sec. 30.....	16	8	"	1909.9	13 27.5	13 27.5	"
" " 30.....	16	8	"	1909.9	13 22.9	13 28.9	"
" " 30.....	16	8	"	1909.9	13 11.0	13 14.0	"
40.00 W.—N.E. cor. sec. 19.....	16	8	"	1909.9	14 18.9	14 17.9	"
41.00 W.—" 30.....	16	8	"	1909.9	13 05.9	13 07.9	"
At $\frac{1}{2}$ sec. cor. E. by sec. 26.....	22	8	"	1910.5	13 27.4	13 32.2	P.R.A. Belanger.
S.E. cor. sec. 4.....	26	8	"	1908.6	13 56.3	14 10.1	"
Centre—E. by. sec. 15.....	33	8	"	1912.0	14 10.0	14 04.3	"
11.50 N.—N.E. cor. sec. 17.....	6	9	"	1911.5	14 36.6	14 35.8	R. C. Purser.
41.00 W.—N.E. cor. sec. 31.....	16	9	"	1909.8	14 12.9	14 09.6	W. J. Deans.
41.00 W.—" 31.....	16	9	"	1909.8	14 25.8	14 22.5	"
At N.E. cor. sec. 21.....	16	9	"	1909.8	12 41.7	12 40.4	"
30.00 E.—N.E. cor. sec. 30.....	16	9	"	1909.8	14 08.8	14 13.5	"
20.00 E.—" 31.....	16	9	"	1909.8	14 05.4	14 12.1	"
20.00 E.—" 31.....	16	9	"	1909.7	14 12.4	"	"
20.00 E.—" 31.....	16	9	"	1909.7	14 04.3	14 13.3	"
20.00 E.—" 31.....	16	9	"	1909.8	14 16.4	14 12.1	"
20.00 E.—" 31.....	16	9	"	1909.8	14 04.3	14 09.0	"
At N.E. cor. sec. 33.....	16	9	"	1909.8	14 01.8	14 07.0	"
40.00 E.—N.E. cor. sec. 32.....	16	9	"	1909.8	13 56.1	13 58.8	"
40.00 E.—" 32.....	16	9	"	1909.8	13 57.0	13 53.7	"
40.00 E.—" 32.....	16	9	"	1909.8	14 10.9	14 11.6	"
At N.E. cor. sec. 29.....	16	9	"	1909.8	14 17.8	14 13.5	"
" " 29.....	16	9	"	1909.8	14 30.8	14 27.5	"
" " 30.....	16	9	"	1909.8	14 22.2	14 22.9	"
" " 30.....	16	9	"	1909.8	14 26.0	14 21.7	"
" " 30.....	16	9	"	1909.8	14 08.4	14 11.1	"
30.00 E.—N.E. cor. sec. 30.....	16	9	"	1909.8	14 11.1	14 13.8	"
At N.E. cor. sec. 7.....	16	9	"	1909.8	14 54.8	14 58.5	"
" " 19.....	16	9	"	1909.8	14 58.5	14 58.2	"
" " 19.....	16	9	"	1909.8	15 03.3	15 02.0	"
" " 31.....	16	9	"	1909.8	14 10.6	14 06.3	"
" " 32.....	16	9	"	1909.8	13 51.9	13 53.6	"
" " 3.....	16	9	"	1909.8	14 31.1	14 32.8	"
" " 32.....	16	9	"	1909.8	13 46.5	13 41.2	"
" " 31.....	16	9	"	1909.8	14 02.2	14 04.9	"
" " 7.....	16	9	"	1909.8	13 50.7	13 52.4	"
" " 5.....	16	9	"	1909.8	14 43.9	14 46.6	"
" " 8.....	16	9	"	1909.8	14 28.9	14 32.6	"
" " 32.....	16	9	"	1909.8	13 57.5	14 06.2	"
" " 32.....	16	9	"	1909.8	13 40.6	13 47.9	"
" " 33.....	16	9	"	1909.8	14 06.6	14 13.9	"
" " 20.....	16	9	"	1909.8	14 38.2	14 37.9	"
30.00 E.—N.E. cor. sec. 30.....	16	9	"	1909.8	14 18.0	14 14.7	"
30.00 E.—" 30.....	16	9	"	1909.8	14 17.8	14 21.1	"
20.00 E.—" 31.....	16	9	"	1909.7	14 17.7	14 23.7	"
20.00 E.—" 31.....	16	9	"	1909.7	14 09.8	14 06.8	"
At N.E. cor. sec. 11.....	30	9	"	1910.5	13 54.9	13 50.9	P.R.A. Belanger.
44.00 S.—N.E. cor. sec. 31.....	30	9	"	1909.4	15 03.0	15 01.1	"
10.60 E.—" 22.....	32	9	"	1912.0	13 14.0	13 09.3	"
62.00 N.—" 7.....	33	9	"	1912.0	13 47.9	13 43.2	"
At S.E. cor. sec. 6.....	15	10	"	1910.8	13 22.3	"	"
At N.E. " 24.....	16	10	"	1909.8	15 12.4	15 14.1	W. J. Deans.
" " 36.....	16	10	"	1909.8	14 40.3	14 37.0	"
" " 1.....	16	10	"	1909.8	15 51.5	15 48.2	"
" " 36.....	16	10	"	1909.8	14 41.4	14 50.1	"
40.00 W.—N.E. cor. sec. 36.....	16	10	"	1909.8	14 23.7	14 26.4	"
At N.E. cor. sec. 36.....	16	10	"	1909.8	14 36.0	14 38.7	"
" " 12.....	16	10	"	1909.8	11 59.5	12 00.2	"



SESSIONAL PAPER No. 25b

TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
					° /	° /	
At N.E. cor. sec. 36.....	16	10	Pr.	1909.8	14 36.0	14 38.7	W. J. Deans.
" " 23.....	17	10	"	1909.8	13 21.5	13 25.2	"
" " 34.....	17	10	"	1909.8	13 50.3	13 52.0	"
" " 24.....	17	10	"	1909.8	13 55.0	13 53.7	"
" " 23.....	17	10	"	1909.8	13 31.2	13 29.9	"
" " 25.....	17	10	"	1909.8	14 26.6	14 29.3	"
" " 25.....	17	10	"	1909.8	14 15.0	14 18.7	"
" " 24.....	17	10	"	1909.8	13 44.4	13 46.1	"
" " 7.....	18	10	"	1910.8	13 12.0	13 16.1	P. R. A. Belanger.
11.00 N.—N.E. cor. sec. 14.....	30	10	"	1909.5	14 19.9	"	"
At N.E. cor. sec. 36.....	8	11	"	1910.8	12 50.8	12 49.9	"
3.00 E.— $\frac{1}{4}$ sec. cor. sec. 33.....	22	11	"	1908.8	15 30.9	15 37.3	W. J. Deans.
At N.E. cor. sec. 33.....	19	12	"	1909.5	14 41.7	14 40.9	"
" " 33.....	19	12	"	1909.5	14 33.4	14 49.6	"
" " 33.....	19	12	"	1909.5	14 32.9	14 42.1	"
" " 33.....	19	12	"	1909.5	14 57.7	14 55.9	"
" " 33.....	19	12	"	1909.5	14 31.7	14 48.9	"
41.00 W.—N.E. cor. sec. 31.....	19	12	"	1909.5	14 39.6	14 45.8	"
41.00 W.—" 31.....	19	12	"	1909.5	14 46.2	14 43.4	"
40.00 E.—" 29.....	20	12	"	1909.9	14 30.2	14 33.2	"
40.00 E.—" 29.....	20	12	"	1909.9	14 46.2	14 48.2	"
At N.E. cor. sec. 28.....	20	12	"	1909.9	14 34.6	14 37.6	"
" " 23.....	20	12	"	1909.9	14 47.8	14 49.8	"
" " 21.....	20	12	"	1909.9	14 41.9	14 41.9	"
50.00 E.—N.E. cor. sec. 17.....	20	12	"	1909.9	14 31.8	14 37.8	"
50.00 E.—" 17.....	20	12	"	1909.9	14 46.9	14 46.9	"
At N.E. cor. sec. 21.....	20	12	"	1909.9	14 44.9	14 49.9	"
15.00 S.—N.E. cor. sec. 4.....	20	12	"	1909.6	14 35.4	14 44.3	"
At N.E. cor. sec. 28.....	20	12	"	1909.9	14 54.6	14 53.6	W. J. Deans.
40.00 E.—N.E. cor. sec. 29.....	20	12	"	1909.9	14 42.0	14 41.0	"
50.00 " " 17.....	20	12	"	1909.9	14 43.5	14 44.5	"
At N.E. cor. sec. 21.....	20	12	"	1909.9	14 48.9	14 49.9	"
" " 21.....	20	12	"	1909.9	14 43.7	14 44.7	"
" " 21.....	20	12	"	1909.9	14 58.2	15 05.2	"
15.00 S.—N.E. cor. sec. 4.....	20	12	"	1909.6	14 51.5	14 50.4	"
20.00 E.—" 9.....	20	13	"	1909.6	14 52.6	"	"
25.00 W.—" 30.....	20	13	"	1909.6	15 02.5	"	"
20.00 E.—" 9.....	20	13	"	1909.6	14 38.7	"	"
20.00 E.—" 9.....	20	13	"	1909.6	14 49.3	14 47.4	"
20.00 E.—" 9.....	20	13	"	1909.6	14 39.8	14 52.9	"
4.00 S.—S.E. cor. sec. 14.....	27	13	"	1909.3	14 49.7	14 56.7	"
At N.E. cor. sec. 10.....	28	13	"	1909.3	15 00.4	15 09.6	"
18.42 W.—N.E. cor. sec. 36.....	28	14	"	1908.7	14 46.7	14 52.2	P. R. A. Belanger.
15.00 W.—" 32.....	17	15	"	1909.8	14 15.9	"	J. Francis.
At N.E. cor. sec. 32.....	17	15	"	1909.8	15 11.1	"	"
" " 22.....	18	15	"	1909.8	14 47.6	14 45.9	"
30.00 W.—N.E. cor. sec. 29.....	18	15	"	1909.9	14 36.7	14 42.7	"
20.00 W.—" 28.....	18	15	"	1909.9	14 53.5	14 51.5	"
32.00 W.—" 21.....	18	15	"	1909.8	14 39.7	"	"
4.00 W.—" 5.....	18	15	"	1909.8	14 40.4	14 42.1	"
35.00 W.—" 36.....	18	15	"	1909.8	14 25.5	14 32.8	"
0.50 E.—" 28.....	18	15	"	1909.8	14 41.5	14 38.8	"
7.00 S.—" 5.....	18	15	"	1909.8	14 42.5	14 47.2	"
15.00 E.—" 4.....	18	15	"	1909.8	15 03.8	15 02.5	"
21.00 N.—" 5.....	18	15	"	1909.8	14 51.7	14 55.4	"
25.00 S.—" 3.....	18	15	"	1909.8	15 05.4	15 16.1	"
66.00 S.—" 5.....	18	15	"	1909.8	14 25.2	14 23.9	"
3.00 S.—" 15.....	19	15	"	1909.9	14 09.2	14 07.2	"
34.00 W.—" 12.....	19	15	"	1909.9	14 21.7	14 28.7	"
At N.E. cor. sec. 11.....	30	15	"	1910.5	15 32.5	15 37.9	T. H. Plunkett.
" " 8.....	31	15	"	1909.6	15 09.3	15 17.4	P. R. A. Belanger.
" " 10.....	32	17	"	1909.6	16 07.8	16 07.9	"
" " 32.....	32	18	"	1909.6	16 40.0	16 43.1	"
45.00 N.—N.E. cor. sec. 9.....	32	18	"	1910.6	16 35.1	16 37.2	"
45.00 N.—" 9.....	32	18	"	1910.6	16 37.6	16 39.7	"
21.00 S.—" 25.....	1	20	"	1911.4	14 55.7	14 55.5	C. F. Aylsworth.
27.00 S.—" 8.....	18	20	"	1910.3	14 49.8	14 54.0	P. R. A. Belanger.



TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912° 0.	
At N.E. cor. sec. 35.....	23	20	Pr.	1908.7	15 48.1		W. J. Deans.
" " 36.....	34	20	"	1910.6	18 41.4	18 43.5	P. R. A. Belanger.
At S.E. " 1.....	35	20	"	1909.5	17 20.8	17 30.0	"
21.00 S.—N.E. cor. sec. 25.....	1	21	"	1911.4	14 53.1		C. F. Aylsworth.
20.00 N.—S.E. " 36.....	1	21	"	1911.4	14 51.6		"
20.00 S.—N.E. " 36.....	1	21	"	1911.4	14 55.3	14 58.1	"
65.00 S.—" " 36.....	1	21	"	1911.4	14 56.1	14 57.9	"
At S.E. cor. sec. 7.....	20	21	"	1910.7	15 44.3	15 43.8	"
30.00 W.—N.E. cor. sec. 35.....	56	21	"	1911.1	17 56.4		E. W. Robinson.
10.00 E.— $\frac{1}{4}$ sec. cor. N. by 12.....	20	22	"	1910.3	16 26.3	16 29.5	P. R. A. Belanger.
At N.E. cor. sec. 11.....	20	22	"	1910.3	16 25.9	16 34.1	"
" " 31.....	56	22	"	1911.1	18 02.6	18 05.3	E. W. Robinson.
10.00 W.—N.E. cor. sec. 34.....	56	22	"	1911.1	18 07.4	18 13.1	"
20.00 N.—" " 36.....	56	22	"	1911.1	18 02.2		"
25.00 W.—" " 31.....	56	24	"	1911.1	18 17.3	18 20.0	"
17.00 E.—" " 35.....	56	24	"	1911.1	17 23.7	17 26.4	"
55.00 E.—" " 34.....	56	24	"	1911.1	18 13.2	18 15.9	"
38.00 E.—" " 35.....	56	25	"	1911.1	18 30.2	18 32.9	"
At N.E. cor. sec. 4.....	13	26	"	1909.5	17 48.1	17 56.7	O. Rolfson.
37.00 W.—N.E. cor. sec. 2.....	13	26	"	1909.4	17 57.9	18 04.8	"
37.00 W.—" " 2.....	13	26	"	1909.5	17 53.1	17 57.3	"
30.00 W.—" " 31.....	56	26	"	1911.1	18 17.9		E. W. Robinson.
At N.E. cor. sec. 35.....	56	26	"	1911.1	18 35.4	18 36.1	"
5.00 S.—N.E. cor. sec. 38.....	22	27	"	1908.5	14 38.8	14 47.3	W. J. Deans.
20.00 N.—" " 17.....	36	27	"	1910.4	18 29.7	18 28.8	D. E. Chartrand.
20.00 N.—" " 17.....	36	27	"	1910.4	18 29.5	18 29.6	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 26.2	18 30.3	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 24.1	18 28.2	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 21.0	18 30.6	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 17.0	18 25.1	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 37.1	18 33.2	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 30.0	18 30.1	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 27.4	18 31.5	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 24.2	18 32.3	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 21.5	18 30.6	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 17.9	18 27.0	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 19.5	18 28.6	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 19.8	18 27.9	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 21.6	18 27.7	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 24.2	18 28.3	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 26.5	18 29.6	"
20.00 N.—N.E. cor. sec. 17.....	36	27	"	1910.4	18 31.2	18 33.3	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 25.9	18 27.5	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 34.0	18 30.5	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 36.7	18 32.2	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 37.5	18 33.6	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 35.8	18 32.9	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 33.6	18 31.7	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 32.7	18 33.8	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 27.7	18 33.8	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 28.0	18 38.6	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 20.6	18 30.2	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 20.7	18 29.8	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 19.5	18 28.6	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 19.3	18 28.4	"
20.00 N.—" " 17.....	36	27	"	1910.4	18 20.1	18 28.2	"
10.00 E.—" " 35.....	56	27	"	1911.1	18 26.0	18 27.7	E. W. Robinson.
At N.E. cor. sec. 36.....	56	28	"	1911.1	18 43.4	18 44.1	"
15.21 E.—N.E. cor. sec. 23.....	25	29	"	1911.5	17 15.9	17 16.1	R. C. Purser.
At N.E. cor. sec. 12.....	25	29	"	1911.5	16 27.5	16 27.7	"
41.00 E.—N.E. cor. sec. 31.....	56	29	"	1911.1	18 40.2		E. W. Robinson.
25.00 W.—" " 33.....	56	29	"	1911.1	18 45.8	18 51.5	"
10.00 E.—" " 35.....	56	29	"	1911.1	18 41.9	18 43.6	"
5.00 S.—" " 17.....	25	30	"	1909.7	16 52.4		J. Francis.
At N.E. cor. sec. 31.....	56	30	"	1911.0	18 42.1	18 45.1	E. W. Robinson.
40.14 S.—N.E. cor. sec. 29.....	8	31	"	1911.5	15 14.4	15 13.5	R. C. Purser.
10.00 N.—N.W. " 21.....	29	31	"	1911.9	19 43.5	19 39.0	C. Rinfret.



SESSIONAL PAPER No. 25b

TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912 '0	
At S. E. cor. sec. 31.....	30	31	Pr.	1910.4	17 19.2	17 17.3	C. F. Aylsworth.
At S. E. cor. sec. 31.....	30	31	"	1910.4	17 12.0	17 17.1	"
5.00 E.—N. E. cor. sec. 34.....	56	31	"	1911.0	19 20.0	19 22.0	E. W. Robinson.
4.00 S.—".....	22	32	"	1909.6	18 21.8	18 17.9	J. Francis.
46.00 N.—".....	16	32	"	1909.6	17 48.0	18 01.1	"
36.00 E.—".....	15	32	"	1909.6	18 23.2	18 20.3	"
25.00 S.—".....	10	32	"	1909.6	17 56.3	18 08.4	"
8.50 N.—".....	30	32	"	1909.6	17 28.6	"	"
40.00 E.—".....	6	32	"	1909.6	17 57.7	18 09.8	"
56.00 N.—S. E. ".....	32	32	"	1909.6	17 09.2	17 21.3	"
30.00 N.—N. E. ".....	6	32	"	1909.6	18 06.3	18 04.4	"
5.00 W.—".....	36	32	"	1909.6	16 42.6	16 55.5	"
At N. E. cor. sec. 35.....	23	32	"	1909.6	16 13.9	16 28.3	"
At N. E. cor. sec. 7.....	29	32	"	1909.5	18 07.6	18 05.8	"
59.00 N.—N. E. cor. sec. 14.....	29	32	"	1909.6	16 45.2	16 42.1	"
At N. E. cor. sec. 17.....	29	32	"	1909.5	17 47.5	17 47.2	"
43.00 W.—34.00 N.—N. E. cor. 27.....	29	32	"	1909.6	16 38.4	16 50.0	"
10.00 S.—N. W. cor. fr. sec. 34.....	31	32	"	1909.6	18 11.8	"	"
45.00 S.—N. W.—cor. fr. sec. 3.....	32	32	"	1009.6	18 22.7	18 25.8	"
At N. E. cor. sec. 13.....	32	33	"	1911.9	19 24.1	19 19.7	C. Rinfret.
" 10.....	24	1	E. Pr.	1908.4	13 17.4	13 26.0	P. R. A. Belanger.
25.00 W.—S. E. cor. fr. tp. 27.....	27	1	"	1911.7	12 58.8	13 01.0	"
20.00 W.—N. E. cor. sec. 33.....	28	1	"	1910.4	12 26.6	12 31.1	E. W. Robinson.
At N. E. cor. sec. 36.....	23	1	"	1910.4	12 28.1	12 35.6	"
10.00 W.—N. E. cor. sec. 31.....	28	2	"	1910.4	12 25.4	12 30.9	"
60.00 W.—N. E. cor. sec. 7.....	29	2	"	1911.7	11 45.4	11 39.4	P. R. A. Belanger.
At N. E. cor. sec. 18.....	29	2	"	1911.7	12 06.9	12 04.1	"
30.00 N.—S. E. cor. sec. 1.....	22	3	"	1910.7	12 11.8	12 13.8	"
30.00 W.—N. E. cor. sec. 31.....	23	3	"	1910.5	12 21.7	"	E. W. Robinson.
10.00 E.—".....	32	3	"	1910.5	12 18.8	12 22.0	"
25.00 W.—".....	35	3	"	1910.5	12 18.6	12 25.8	"
10.00 E.—".....	33	4	"	1910.5	12 13.4	12 15.2	"
10.00 W.—".....	35	4	"	1910.5	12 14.0	12 18.8	"
30.00 N.—".....	24	5	"	1911.6	9 51.2	9 49.7	C. F. Aylsworth.
30.00 N.—".....	24	5	"	1911.6	9 53.1	9 50.6	"
30.00 N.—".....	24	5	"	1911.6	9 52.3	9 49.8	"
30.00 N.—".....	24	5	"	1911.6	9 53.0	9 49.5	"
11.00 E.—".....	31	5	"	1910.5	12 03.0	12 06.8	E. W. Robinson.
42.00 N.—N. W. ".....	29	6	"	1911.3	13 06.8	13 10.9	C. F. Aylsworth.
42.00 N.—".....	29	6	"	1911.3	13 08.7	13 12.8	"
12.00 W.—S. E. cor. sec. 2.....	15	6	"	1911.8	13 30.3	13 28.3	"
12.00 W.—".....	2	6	"	1911.8	13 30.5	13 28.5	"
12.00 W.—".....	2	6	"	1911.8	13 30.4	13 28.4	"
12.00 W.—".....	2	6	"	1911.8	13 30.4	13 27.4	"
At S. E. cor. sec. 3.....	15	6	"	1911.8	13 10.7	13 04.7	"
" 3.....	15	6	"	1911.8	13 10.5	13 05.5	"
42.00 W.—S. E. cor. sec. 3.....	15	6	"	1911.8	13 21.4	13 21.4	"
42.00 W.—".....	3	6	"	1911.8	13 20.4	13 20.4	"
20.00 W.—".....	4	6	"	1911.8	13 17.3	13 12.3	"
20.00 W.—".....	4	6	"	1911.8	13 17.6	13 13.5	"
30.00 W.—".....	5	6	"	1911.8	12 45.6	12 45.6	"
30.00 W.—".....	5	6	"	1911.8	12 45.9	12 45.9	"
20.00 S.—N. E. cor. sec. 4.....	15	6	"	1911.8	13 22.1	13 18.1	"
20.00 S.—".....	4	6	"	1911.8	13 21.7	13 17.7	"
40.00 S.—".....	4	6	"	1911.8	13 18.5	13 14.5	"
40.00 S.—N. E. cor. sec. 4.....	15	6	"	1911.8	13 19.1	13 15.1	C. F. Aylsworth.
5.00 N.—N. W. ".....	5	6	"	1911.8	12 07.4	12 04.2	"
5.00 N.—".....	5	6	"	1911.8	12 08.5	12 05.3	"
40.00 W.—N. E. ".....	19	6	"	1911.8	12 33.7	12 30.5	"
40.00 W.—".....	19	6	"	1911.8	12 33.4	12 30.2	"
49.00 N.—N. W. ".....	30	6	"	1911.8	12 48.1	12 42.9	"
40.00 N.—".....	30	6	"	1911.8	12 47.7	12 42.5	"
30.00 E.—N. E. ".....	32	6	"	1911.9	12 34.5	12 28.0	"
30.00 E.—".....	32	6	"	1911.9	12 33.4	12 27.9	"
50.00 E.—".....	33	6	"	1911.9	12 58.2	12 54.7	"
50.00 E.—".....	33	6	"	1011.9	12 57.5	12 54.0	"
43.00 E.—".....	34	6	"	1911.9	12 39.0	12 35.5	"



TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
40°00' W.—N.E. cor. sec. 30.....	16	7	E. Pr.	1910.7	12 10 7	12 11 7	P. R. A. Belanger
10°00' W.—" " " 1.....	1	13	"	1910.0	9 30 1	.....	"
6°00' S.— $\frac{1}{4}$ sec. cor. E. by 17.....	11	13	"	1910.7	11 00 0	11 00 0	"
41°50' N.—N.E. cor. sec. 23.....	10	14	"	1909.8	11 32 2	11 39 5	"
At N.E. cor. sec. 6.....	11	14	"	1910.7	9 14 8	9 15 8	"
16°00' N.—N.E. cor. sec. 1.....	1	15	"	1908.5	9 31 1	9 40 6	"
At N.E. cor. sec. 24.....	1	15	"	1910.7	8 51 4	.....	E. W. Hubbell.
At " " 24.....	10	15	"	1909.8	10 05 7	10 10 0	P. R. A. Belanger
At " " 6.....	2	16	"	1910.7	9 20 7	9 21 7	E. W. Hubbell.
30°00' S.—N.E. cor. sec. 36.....	3	16	"	1910.7	10 26 6	10 26 1	"
30°00' S.—" " " 10.....	4	16	"	1910.7	10 22 8	.....	"
20°00' N.—" " " 3.....	5	16	"	1910.8	8 43 1	.....	"
At N.E. cor. sec. 11.....	10	16	"	1909.8	10 46 0	10 49 7	P. R. A. Belanger
53°65' S.—N.E. cor. sec. 29.....	16	16	"	1911.3	9 10 3	.....	"
1°77' S.—" " " 15.....	16	16	"	1911.4	12 11 9	12 12 7	"
1°18' N.—N.E. cor. sec. 13.....	16	16	"	1911.4	10 13 6	.....	"
At N.E. cor. sec. 31.....	2	17	"	1910.7	9 11 4	9 17 4	E. W. Hubbell.
At " " 7.....	4	17	"	1910.8	9 33 3	.....	"
At " " 8.....	10	17	"	1909.8	8 28 0	.....	P. R. A. Belanger
33°61' S.—N.E. cor. sec. 15.....	15	17	"	1911.6	10 44 6	10 37 1	"
71°06' S.—" " " 9.....	16	17	"	1911.5	10 14 4	10 16 5	"
8°09' S.—" " " 17.....	16	17	"	1911.5	8 42 2	.....	"
30°00' N.—N.E. cor. sec. 24.....	56	1	2	1911.0	19 00 6	19 03 6	E. W. Robinson.
At N.E. cor. sec. 36.....	56	1	2	1911.0	19 18 6	19 21 6	"
7°00' E.—N.E. cor. sec. 35.....	56	1	2	1911.9	19 09 3	19 04 8	"
10°00' E.—" " " 34.....	56	1	2	1911.9	19 21 3	19 16 8	"
36°00' N.—" " " 12.....	57	1	2	1911.2	18 47 0	18 49 1	"
30°00' S.—" " " 1.....	58	1	2	1911.2	19 07 1	19 08 2	"
30°00' N.—" " " 12.....	58	1	2	1911.2	18 39 0	18 41 1	"
20°00' S.—" " " 25.....	58	1	2	1911.2	19 11 2	19 13 3	"
45°00' N.—" " " 1.....	59	1	2	1911.2	19 30 1	19 32 2	"
30°00' S.—" " " 24.....	59	1	2	1911.2	19 34 9	.....	"
10°00' S.—" " " 36.....	59	1	2	1911.2	19 17 0	19 20 1	"
10°00' N.—" " " 24.....	60	1	2	1911.2	19 51 8	.....	"
17°00' N.—" " " 13.....	61	1	2	1911.2	20 07 5	20 08 6	"
15°00' N.—" " " 25.....	61	1	2	1911.2	20 03 0	.....	"
8°72' N.—" " " 12.....	62	1	2	1911.6	20 41 5	20 40 4	"
10°00' S.—" " " 13.....	62	1	2	1911.6	20 43 6	20 46 5	"
65°00' N.—" " " 24.....	62	1	2	1911.6	21 03 4	21 03 3	"
20°00' S.—" " " 36.....	62	1	2	1911.6	20 57 5	.....	"
10°00' N.—" " " 1.....	63	1	2	1911.6	21 22 5	21 24 0	"
20°00' S.—" " " 24.....	63	1	2	1911.6	21 20 9	21 17 4	"
5°00' S.—" " " 1.....	64	1	2	1911.6	21 42 8	21 41 3	"
12°00' S.—" " " 25.....	64	1	2	1911.7	20 35 3	20 29 5	"
35°00' N.—" " " 13.....	65	1	2	1911.7	21 32 9	21 30 1	"
16°00' N.—" " " 1.....	66	1	2	1911.7	22 33 0	22 28 0	"
30°00' N.—" " " 13.....	67	1	2	1911.7	20 36 6	20 33 6	"
20°00' S.—" " " 6.....	44	2	2	1910.4	18 41 4	18 45 3	E. W. Hubbell.
18°00' W.—" " " 33.....	56	2	2	1911.9	19 17 6	19 13 2	E. W. Robinson.
16°00' N.—" " " 14.....	10	3	2	1911.5	17 06 5	17 10 7	C. F. Aylsworth.
16°00' N.—" " " 14.....	10	3	2	1911.5	17 07 4	17 11 6	"
16°00' N.—" " " 14.....	10	3	2	1911.5	17 07 1	17 14 7	"
16°00' N.—" " " 14.....	10	3	2	1911.5	17 08 5	17 13 0	"
16°00' N.—" " " 14.....	10	3	2	1911.5	17 09 1	17 13 3	"
At $\frac{1}{4}$ cor. E. by sec. 17.....	21	3	2	1910.5	18 44 6	18 41 5	P. A. Carson.
Centre of sec. 16.....	21	3	2	1910.5	18 41 8	18 44 6	"
" " 16.....	21	3	2	1910.5	18 51 3	18 49 1	"
At N.E. cor. sec. 32.....	21	3	2	1910.5	18 17 0	18 24 4	"
At $\frac{1}{4}$ post E. by sec. 17.....	21	3	2	1910.5	18 47 4	18 44 8	"
" " 17.....	21	3	2	1910.5	18 46 0	18 42 9	"
" " 17.....	21	3	2	1910.5	18 29 0	18 37 9	"
" " 17.....	21	3	2	1910.5	18 28 8	18 37 2	"
" N.E. cor. sec. 21.....	44	3	2	1910.4	20 59 1	21 03 0	E. W. Hubbell.
60°00' N.—N.E. cor. sec. 8.....	45	3	2	1910.4	19 33 0	19 35 9	"
3°00' W.—" " " 33.....	56	3	2	1911.9	18 25 4	18 23 0	E. W. Robinson.
40°00' S.—" " " 9.....	21	4	2	1910.6	18 34 2	18 36 7	P. A. Carson.



SESSIONAL PAPER No. 25b

TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
40°00 S.—N.E. cor. sec. 9.....	21	4	2	1910.6	18 42 2	18 39 2	P. A. Carson.
At N.E. cor. sec. 16.....	21	4	2	1910.6	18 36 0	18 42 5	"
At $\frac{1}{2}$ cor. E. by sec. 9.....	21	4	2	1910.6	18 44 4	18 39 9	"
At $\frac{1}{2}$ cor. E. by sec. 9.....	21	4	2	1910.6	18 26 4	18 34.9	"
15°00 E.—N.E. cor. sec. 26.....	24	4	2	1909.7	18 26.3	18 21.3	J. Francis.
30°00 S.—" 27.....	24	4	2	1909.7	18 15.0	18 21.0	"
At N.E. cor. sec. 34.....	24	4	2	1909.7	18 19.5	18 20.5	"
" " 21.....	24	4	2	1909.7	18 06 2	18 04.2	"
50°00 W.—N.E. cor. sec. 32.....	24	4	2	1909.7	18 19.0	18 26.0	"
30°00 W.—20°00 N.—S.E. cor. 23.....	24	4	2	1909.7	17 56.2	18 04.2	"
43°44 E.—N.W. cor. sec. 2.....	25	4	2	1909.4	17 52.8	17 57.7	"
3°00 W.—N.E. cor. sec. 12.....	44	4	2	1910.4	17 41.5	17 45.4	E. W. Hubbell.
5°00 E.—" 33.....	56	4	2	1911.9	19 55.8	19 49.4	E. W. Robinson.
10°00 E.—" 31.....	56	4	2	1911.9	20 18 8	"	"
2°00 W.—" 36.....	11	5	2	1909.5	17 16.6	17 20.8	O. Rolfson.
10°00 E.—" 31.....	11	5	2	1909.6	17 41.2	17 47.3	"
40°00 S.—" 21.....	12	5	2	1909.6	17 14.2	17 18.3	"
60°35 S.—" 24.....	12	5	2	1909.6	17 34.0	17 41.9	"
5°00 S.—S.E. cor. sec. 8.....	12	5	2	1909.6	17 29.9	17 38.0	"
54°00 S.—N.E. cor. sec. 5.....	12	5	2	1909.6	17 28.1	17 35.2	"
40°00 E.—" 8.....	12	5	2	1909.6	17 16.6	17 26.7	"
1°00 E.—S.E. cor. sec. 4.....	12	5	2	1909.6	17 45.8	"	"
40°00 S.—N.E. cor. sec. 1.....	27	5	2	1909.4	18 54.2	19 01.1	J. Francis.
At S.E. cor. sec. 3.....	28	5	2	1910.6	18 49.4	"	C. F. Aylsworth.
At N.E. cor. sec. 8.....	40	5	2	1911.8	18 32.9	18 26.7	P. R. A. Belanger
2°00 N.—N.E. cor. sec. 8.....	40	5	2	1911.8	18 18.3	18 15.1	"
29°05 N.—" 20.....	44	5	2	1910.4	19 48.5	19 52.9	E. W. Hubbell.
11°00 W.—" 34.....	56	5	2	1911.9	20 28.2	20 23.8	E. W. Robinson.
20°00 W.—" 36.....	56	6	2	1912.0	20 17.7	20 14.0	"
23°00 W.—" 33.....	56	6	2	1912.0	20 33.4	20 29.7	"
17°00 W.—" 32.....	56	6	2	1912.0	21 02.7	20 37.0	"
56°00 N.—S.E. cor. sec. 16.....	14	7	2	1909.8	18 46.7	18 49.4	O. Rolfson.
At N.W. cor. sec. 31.....	14	7	2	1909.8	18 55.3	18 57.0	"
At S.E. cor. sec. 4.....	14	7	2	1909.8	19 32.5	19 33.2	"
" " 6.....	23	7	2	1910.4	18 27.4	18 26.5	D. E. Chartrand.
" " 6.....	23	7	2	1910.4	18 15.7	18 17.8	"
64°50 W.—N.E. cor. sec. 22.....	40	7	2	1911.8	20 03.3	19 58.1	P. R. A. Belanger.
At N.E. cor. sec. 7.....	42	7	2	1910.3	20 06.2	20 11.4	E. W. Hubbell.
" " 36.....	56	7	2	1912.0	21 05.7	20 59.0	E. W. Robinson.
" " 33.....	7	8	2	1909.7	17 56.8	18 01.8	O. Rolfson.
" " 8.....	37	8	2	1909.8	21 55.5	21 54.2	E. W. Hubbell.
10°00 S.—N.E. cor. sec. 8.....	37	8	2	1909.8	21 57.7	"	"
77°00 S.—" 1.....	38	8	2	1909.5	21 21.2	21 26.6	"
12°00 E.—N.W. cor. sec. 31.....	41	8	2	1910.3	20 23.4	20 27.6	"
At S.E. cor. sec. 1.....	43	8	2	1910.3	20 26.7	20 31.9	"
At N.E. cor. sec. 24.....	44	8	2	1911.0	20 54.4	20 57.3	"
" " 36.....	56	8	2	1912.0	20 11.2	20 04.5	E. W. Robinson.
At S.E. cor. sec. 5.....	15	9	2	1909.8	18 34.6	18 38.9	O. Rolfson.
5°00 N.—N.E. cor. sec. 18.....	39	10	2	1911.9	19 50.3	19 47.8	P. R. A. Belanger.
3°74 N.—" 25.....	42	10	2	1910.3	20 32.4	20 41.6	E. W. Hubbell.
20°00 S.—" 34.....	44	10	2	1911.0	20 29.2	20 28.1	"
40°00 W.—" 36.....	9	11	2	1911.4	20 14.3	20 21.1	G. A. Bennett.
At $\frac{1}{2}$ cor. E. By. sec. 29.....	23	11	2	1910.5	18 48.6	18 43.0	P. A. Carson.
" " 29.....	23	11	2	1910.5	18 41 6	18 44.0	"
At N.E. cor. sec. 35.....	45	11	2	1911.8	21 22.3	21 15.3	P. R. A. Belanger
10°00 W.—N.E. cor. sec. 33.....	45	11	2	1911.8	19 36.6	19 33.6	"
40°00 N.—N.E. cor. sec. 1.....	47	11	2	1911.8	21 19.4	"	"
40°00 W.—S.E. cor. sec. 2.....	47	11	2	1911.8	20 28.7	20 24.7	"
At centre—E. By. sec. 23.....	49	11	2	1911.0	19 16.1	19 07.6	"
" " 24.....	50	11	2	1911.9	18 56.7	18 46.2	"
33°00 W.—S.W. cor. sec. 2.....	51	11	2	1911.9	18 31.5	18 28.0	"
50°00 S.—N.E. cor. sec. 32.....	1	12	2	1909.7	18 13.0	18 11.8	O. Rolfson.
41°00 E.—" 32.....	1	12	2	1909.7	18 05.3	18 18.1	"
50°00 S.—" 4.....	1	12	2	1909.7	18 03.2	18 08.2	"
At N.E. cor. sec. 12.....	1	12	2	1909.7	18 23.5	18 20.5	"
At S.E. cor. sec. 3.....	1	12	2	1909.7	18 00.5	18 10.5	"



TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
6.00 S.—N.W. cor. sec. 36.....	2	12	2	1909.7	18 06.3	18 17.3	O. Rolfson.
At S.E. cor. sec. 4.....	2	12	2	1909.7	18 19.9	18 15.9	"
16.00 N.—S.W. cor. sec. 6.....	2	12	2	1909.7	18 14.8	18 12.8	"
10.00 S.—N.E. cor. sec. 12.....	2	12	2	1909.7	18 18.4	18 26.4	"
At S.E. cor. sec. 6.....	2	12	2	1909.7	18 33.4	18 31.4	"
At N.E. cor. sec. 24.....	2	12	2	1909.7	18 21.6	18 29.6	"
At S.E. cor. sec. 6.....	2	12	2	1910.7	18 13.7	18 14.2	C. F. Aylsworth.
15.00 S. of $\frac{1}{4}$ post E. by sec. 8.....	26	12	2	1910.5	19 24.3	19 25.7	P. A. Carson.
15.00 " " " 8.....	26	12	2	1910.5	19 27.1	19 28.5	"
15.00 " " " 8.....	26	12	2	1910.5	19 25.4	19 23.8	"
15.00 " " " 8.....	26	12	2	1910.5	19 28.2	19 25.6	"
15.00 " " " 8.....	26	12	2	1910.5	19 27.7	19 27.1	"
15.00 " " " 8.....	26	12	2	1910.5	19 27.1	19 25.5	"
15.00 " " " 8.....	26	12	2	1910.5	19 25.1	19 27.5	"
15.00 " " " 8.....	26	12	2	1910.5	19 21.6	19 24.0	"
15.00 " " " 8.....	26	12	2	1910.5	19 17.5	19 22.9	"
15.00 " " " 8.....	26	12	2	1910.5	19 14.4	19 23.3	"
15.00 S. of $\frac{1}{4}$ post E. by sec. 8.....	26	12	2	1910.5	19 11.6	19 18.1	"
15.00 S. " " " 8.....	26	12	2	1910.5	19 08.5	19 15.9	"
15.00 S. " " " 8.....	26	12	2	1910.5	19 08.9	19 16.3	"
15.00 S. " " " 8.....	26	12	2	1910.5	19 10.1	19 18.0	"
15.00 S. " " " 8.....	26	12	2	1910.5	19 13.2	19 20.1	"
15.00 S. " " " 8.....	26	12	2	1910.5	19 16.4	19 21.8	"
15.00 S. " " " 8.....	26	12	2	1910.5	19 17.5	19 21.4	"
15.00 S. " " " 8.....	26	12	2	1910.5	19 19.3	19 22.7	"
15.00 S. " " " 8.....	26	12	2	1910.5	19 16.6	19 20.0	"
60.00 W.—N. E. cor. sec. 9.....	44	12	2	1909.8	18 30.9	18 28.6	E. W. Hubbell.
At N. E. cor. sec. 33.....	47	12	2	1909.7	18 59.5	18 53.5	"
" " " 20.....	49	12	2	1909.7	19 25.0	19 31.0	"
42.00 E.—S. E. cor. sec. 5.....	3	13	2	1909.7	18 07.3	18 09.3	O. Rolfson.
At N. E. cor. sec. 24.....	42	13	2	1909.8	17 57.0	17 49.7	E. W. Hubbell.
" " " 36.....	50	13	2	1909.8	20 04.5	20 02.2	"
20.00 N.—N. E. cor. sec. 2.....	52	13	2	1909.8	23 29.6	23 21.3	"
10.00 E.—S. E. " 5.....	3	14	2	1909.7	18 08.7	18 14.5	O. Rolfson.
15.00 S.—N. E. " 30.....	27	14	2	1910.5	19 15.2	19 11.6	P. A. Carson.
11.00 E.— $\frac{1}{4}$ cor. S. by 29.....	27	14	2	1910.5	19 01.3	19 07.2	"
67.45 N.—N. E. cor. sec. 12.....	42	14	2	1910.4	19 25.2	19 25.1	E. W. Hubbell.
At N. E. cor. sec. 16.....	50	14	2	1909.7	23 16.0	23 20.0	"
15.00 S.—N. E. cor. sec. 8.....	8	15	2	1911.6	21 02.6	.....	G. A. Bennett.
25.00 S.—" 3.....	18	15	2	1909.8	15 05.4	.....	J. Francis.
At $\frac{1}{4}$ cor. E. by sec. 36.....	27	15	2	1910.5	19 05.4	19 00.8	P. A. Carson.
" " " 25.....	27	15	2	1910.5	19 02.0	19 03.4	"
At S. E. cor. sec. 25.....	27	15	2	1910.5	19 06.5	19 02.9	"
5.00 E.—N. E. cor. sec. 21.....	17	16	2	1911.5	19 02.9	19 03.0	C. Rinfret.
At N. E. cor. sec. 21.....	17	17	2	1911.5	18 53.3	18 53.4	"
" " " 10.....	19	17	2	1911.5	18 30.2	18 29.4	"
" " " 10.....	19	17	2	1911.5	18 38.5	18 31.7	"
" " " 10.....	19	17	2	1911.5	18 30.8	18 34.0	"
20.00 S.— $\frac{1}{4}$ E. by sec. 10.....	31	17	2	1910.5	19 28.7	19 31.7	D. E. Chartrand.
At N. E. cor. sec. 22.....	17	18	2	1911.5	18 46.9	18 43.0	C. Rinfret.
" " " 15.....	34	18	2	1910.6	19 46.8	19 48.9	P. A. Carson.
" " " 15.....	34	18	2	1910.6	19 48.6	19 50.7	"
Lac la Rouge.....	71	19	2	1909.6	24 27.1	24 31.2	L. R. Ord.
" " " ".....	71	19	2	1909.7	24 14.4	.....	"
" " " ".....	71	19	2	1909.7	23 46.4	23 50.4	"
" " " ".....	71	19	2	1909.5	24 56.2	25 04.8	"
" " " ".....	71	19	2	1909.5	24 49.0	24 56.2	"
" " " ".....	71	19	2	1909.6	24 00.2	24 07.1	"
" " " ".....	71	19	2	1909.6	26 23.4	20 27.5	"
" " " ".....	71	19	2	1909.6	26 15.8	26 21.9	"
" " " ".....	71	19	2	1909.6	22 50.8	22 57.7	"
" " " ".....	71	19	2	1909.6	24 23.2	24 34.1	"
30.00 W.—N. E. cor. sec. 13.....	42	21	2	1910.8	19 37.4	19 39.5	D. E. Chartrand.
5.00 S. 10.00 E. $\frac{1}{4}$ cor. E. by 29.....	45	21	2	1910.7	20 28.2	20 21.2	P. A. Carson.



SESSIONAL PAPER No. 25b

TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
5.00 S. 10.00 E. $\frac{1}{4}$ cor. E. by 29.....	45	21	2	1910.7	20 25.7	20 18.7	P. A. Carson.
5.00 S. 10.00 " 29.....	45	21	2	1910.7	20 24.1	20 17.1	"
5.00 S. 10.00 " 29.....	45	21	2	1910.7	20 24.5	20 18.5	"
5.00 S. 10.00 " 29.....	45	21	2	1910.7	20 23.7	20 19.7	"
5.00 S. 10.00 " 29.....	45	21	2	1910.7	20 22.0	20 21.5	"
5.00 S. 10.00 " 29.....	45	21	2	1910.7	20 18.6	20 20.6	"
5.00 S. 10.00 " 29.....	45	21	2	1910.7	20 15.9	20 21.4	"
5.00 S. 10.00 " 29.....	45	21	2	1910.7	20 14.4	20 20.9	"
5.00 S. 10.00 " 29.....	45	21	2	1910.7	20 12.3	20 17.8	"
5.00 S. 10.00 " 29.....	45	21	2	1910.7	20 13.0	20 16.5	"
5.00 S. 10.00 " 29.....	45	21	2	1910.7	20 12.8	20 16.3	"
5.00 S. 10.00 " 29.....	45	21	2	1910.7	20 12.4	20 14.4	"
5.00 S. 10.00 " 29.....	45	21	2	1910.7	20 13.4	20 15.4	"
5.00 S. 10.00 " 29.....	45	21	2	1910.7	20 15.0	20 17.0	"
5.00 S. 10.00 " 29.....	45	21	2	1910.7	20 24.0	20 21.0	"
5.00 S. 10.00 " 29.....	45	21	2	1910.7	20 19.5	20 19.3	"
At N. E. cor. sec. 35.....	46	21	2	1908.7	21 14.5	21 20.0	W. R. Reilly.
15.00 E.—N. E. cor. sec. 31.....	46	21	2	1908.7	20 53.8	21 05.3	"
2.00 N.—N. E. cor. sec. 11.....	48	21	2	1910.5	21 24.9	21 27.7	E. W. Hubbell.
60.00 S.—" " 31.....	49	21	2	1909.4	21 18.3	21 26.2	W. R. Reilly.
30.00 S.—" " 19.....	49	21	2	1909.4	20 50.6	21 05.3	"
20.00 S.—" " 19.....	49	21	2	1909.4	21 12.3	21 13.0	"
20.00 S.—" " 30.....	49	21	2	1909.4	21 15.7	21 21.4	"
20.00 E.—S. W. " 23.....	49	21	2	1909.4	21 00.6	21 03.5	"
20.00 S.—N. E. " 33.....	49	21	2	1909.4	20 46.8	20 55.7	"
10.00 S.—N. E. " 28.....	49	21	2	1909.4	21 02.1	21 07.0	"
60.00 E. S. W. " 27.....	49	21	2	1909.4	20 43.9	20 53.8	"
60.00 S.—N. E. " 34.....	49	21	2	1909.4	21 18.4	21 21.3	"
30.00 S.—N. E. " 14.....	49	21	2	1909.4	21 44.1	21 52.0	"
50.00 S.—N. E. " 26.....	49	21	2	1909.4	21 43.1	21 44.0	"
30.00 W.—S. E. " 17.....	49	21	2	1909.4	20 55.3	20 56.2	"
20.00 S.—N. E. " 27.....	49	21	2	1909.4	21 05.7	21 13.6	"
50.00 S.—N. E. " 22.....	49	21	2	1909.4	21 21.7	21 24.6	"
30.00 E.—S. W. " 13.....	49	21	2	1909.4	20 57.6	21 08.0	"
30.00 W.—N. E. cor. sec. 19.....	49	21	2	1909.4	21 14.0	21 19.9	W. R. Reilly.
20.00 S.—" " 32.....	49	21	2	1909.4	21 13.3	21 22.2	"
30.00 S.—" " 20.....	49	21	2	1909.4	20 51.9	21 00.8	"
60.00 S.—" " 20.....	49	21	2	1909.4	20 53.7	21 01.6	"
Sta. 6 Traverse of Dead Moose Lake.	33	22	2	1910.6	20 09.6	20 02.1	P. A. Carson.
At $\frac{1}{4}$ cor. W. by sec. 31.....	45	22	2	1910.7	20 01.6	20 01.6	"
" " 31.....	45	22	2	1910.7	20 08.5	20 05.3	"
At N.E. cor. sec. 33.....	46	22	2	1908.7	21 09.8	21 17.3	W. R. Reilly.
At S.E. cor. sec. 4.....	15	23	2	1911.5	19 36.4	19 38.6	C. Rinfret.
At N.E. cor. sec. 34.....	15	23	2	1911.5	19 28.1	19 31.3	"
5.50 W.—N.E. cor. sec. 25.....	38	23	2	1910.6	19 57.9	20 04.0	P. A. Carson.
At N.E. cor. sec. 31.....	16	24	2	1911.4	19 20.9	19 20.7	C. Rinfret.
10 60 N.—N.E. cor. sec. 4.....	47 A	24	2	1908.9	21 30.7	21 35.8	W. R. Reilly.
70.00 S.—" 31.....	49	24	2	1910.6	22 44.4	22 49.5	C. F. Miles.
40.00 W.—" 8.....	63	24	2	1911.2	23 23.6	23 23.6	A. Saint Cyr.
N.E. cor. sec. 35.....	52	25	2	1911.8	22 15.2	22 11.2	E. W. Hubbell
At N.E. cor. sec. 21.....	15	26	2	1911.6	19 20.0	19 20.0	C. Rinfret.
" " 20.....	16	26	2	1911.6	20 01.4	20 00.3	"
3 00 N.—N.E. cor. sec. 36.....	53	26	2	1911.8	22 37.4	22 34.4	E. W. Hubbell.
40.00 N.—" 6.....	58	26	2	1911.1	23 30.6	23 35.3	A. Saint Cyr.
At N.E. cor. sec. 28.....	58	26	2	1911.1	22 52.0	22 52.0	"
5.00 S.—N.E. cor. sec. 32.....	15	27	2	1911.4	19 57.8	20 01.2	C. F. Miles.
30.00 S.—" 17.....	15	27	2	1911.4	19 24.4	19 27.8	"
75 61 W.—" 36.....	45	27	2	1911.5	21 43.9	21 44.1	E. W. Hubbell.
At N.E. cor. 27.....	45	27	2	1911.5	22 15.7	22 15.9	"
30.00 S.—N.E. cor. sec. 21.....	45	27	2	1909.7	23 03.5	23 07.5	W. R. Reilly.
65.00 N.—" 17.....	45	27	2	1909.7	23 22.2	23 23.7	"
20.00 W.—" 17.....	45	27	2	1909.7	23 24.8	23 28.6	"
10.00 W.—" 22.....	45	27	2	1909.8	23 06.4	23 05.1	"
30.00 S.—" 14.....	45	27	2	1909.8	23 04.9	23 09.6	"



TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912 '0	
14 00 E.—N.E. cor. sec. 15.....	45	27	2	1909.8	23 08.0	23 08.7	W. R. Reilly.
60.00 S.—" 23.....	45	27	2	1909.8	23 08.7	"	"
45.00 S.—" 31.....	48	27	2	1910.6	22 49.8	22 50.9	C. F. Miles.
6.00 S.—" 8.....	49	27	2	1910.6	23 30.5	23 31.6	E. W. Hubbell.
15.00 E.—" 12.....	15	28	2	1911.4	19 23.2	19 30.6	C. F. Miles.
40.00 W.—" 14.....	45	28	2	1909.7	24 39.2	24 43.0	W. R. Reilly.
40.00 S.—" 14.....	45	28	2	1909.6	24 29.7	24 35.8	"
76.00 W.—" 19.....	36	1	3	1909.6	22 50.6	23 00.7	"
At S.E. cor. sec. 6.....	36	1	3	1909.6	21 53.6	21 59.7	"
8.00 E.—N.E. cor. sec. 22.....	36	1	3	1909.6	22 06.7	22 04.8	"
60.00 W.—" 12.....	36	1	3	1909.6	22 20.0	22 29.1	"
40.00 W.—" 7.....	36	1	3	1909.6	22 14.6	22 14.7	"
16.00 S.—" 9.....	36	1	3	1909.6	22 19.3	22 19.2	"
8.00 N.—" 12.....	36	1	3	1909.6	22 30.3	22 46.2	"
24.00 S.—" 22.....	36	1	3	1909.6	22 17.9	22 28.3	"
24.00 S.—" 14.....	36	1	3	1909.6	22 32.7	22 34.1	"
12.00 N.—" 10.....	41	1	3	1909.5	20 51.3	21 03.5	"
26.00 S.—" 27.....	41	1	3	1909.5	20 43.5	"	"
50.00 S.—" 27.....	41	1	3	1909.5	21 01.6	21 02.8	"
70.00 S.—" 9.....	41	1	3	1909.5	21 08.1	21 15.3	"
10.00 S.—" 20.....	41	1	3	1909.5	21 41.3	21 50.5	"
30.00 S.—" 31.....	41	1	3	1909.5	21 16.3	21 16.5	"
30.00 S.—" 20.....	41	1	3	1909.5	21 21.1	21 28.3	"
At N.E. cor. sec. 9.....	41	1	3	1909.6	20 51.8	20 58.2	"
20.00 W.—N.E. cor. sec. 20.....	41	1	3	1909.6	21 32.8	21 41.7	"
8.00 E.—" 21.....	41	1	3	1909.6	20 55.2	20 54.1	"
6.00 E.—" 23.....	41	1	3	1909.6	21 05.3	21 10.2	"
64.00 S.—" 4.....	42A	1	3	1909.5	21 26.0	21 37.2	"
34.00 S.—" 10.....	42A	1	3	1909.5	21 22.9	21 22.1	"
20.00 W.—" 16.....	42A	1	3	1909.5	22 07.3	22 14.5	"
At N.E. cor. sec. 24.....	45	1	3	1909.6	25 31.7	25 37.8	"
77.00 S.—N.E. cor. sec. 1.....	53	1	3	1910.0	22 50.2	22 52.5	A. Saint Cyr.
9.00 S.—" 1.....	56	1	3	1909.1	22 27.9	22 37.3	"
2.88 E.—N.W. cor. sec. 34.....	56	1	3	1909.8	23 09.7	23 12.4	Wm. Christie.
7.15 E.—" 33.....	56	1	3	1909.8	22 59.1	22 56.8	"
" " 33.....	56	1	3	1909.8	22 51.9	22 59.6	"
23.00 N.—N.E. cor. sec. 25.....	59	1	3	1910.4	23 55.4	23 59.3	A. Saint Cyr.
" " 25.....	59	1	3	1910.4	23 55.9	23 53.8	"
" " 25.....	59	1	3	1910.4	23 38.8	23 46.7	"
" " 25.....	59	1	3	1910.4	23 39.6	23 44.5	"
" " 25.....	59	1	3	1910.4	22 55.3	22 59.2	"
" " 25.....	59	1	3	1910.4	23 53.8	23 52.7	"
" " 25.....	59	1	3	1910.4	23 37.0	23 45.9	"
" " 25.....	59	1	3	1910.4	23 40.3	"	"
40.00 N.—N.E. cor. sec. 34.....	59	1	3	1910.4	25 27.1	25 24.2	"
" " 34.....	59	1	3	1910.4	25 08.6	25 16.7	"
55.00 N.—" 13.....	60	1	3	1909.2	22 43.1	"	"
75.00 N.—" 12.....	61	1	3	1910.5	23 34.9	23 38.7	"
10.00 N.—" 36.....	62	1	3	1910.5	25 29.4	25 32.8	"
40.00 N.—" 25.....	63	1	3	1910.6	24 32.4	24 34.5	"
40.00 N.—N.E. cor. sec. 21.....	64	1	3	1910.6	25 04.1	25 03.2	A. Saint Cyr.
At N.E. cor. sec. 24.....	64	1	3	1910.6	24 54.4	24 57.5	"
41.00 E.—N.E. cor. sec. 31.....	36	2	3	1911.6	21 55.9	"	R. C. Purser.
1.50 N.—" 19.....	43	2	3	1911.6	23 47.4	23 43.3	"
20.56 E.—N.W. " 35.....	56	2	3	1909.7	24 08.9	"	Wm. Christie.
60.34 E.—" 31.....	56	2	3	1909.7	23 52.1	"	"
47.48 E.—" 35.....	56	2	3	1909.7	23 56.9	"	"
13.00 W.—N.E. " 33.....	60	2	3	1909.4	23 16.0	23 23.7	A. Saint Cyr.
30.00 W.—" 32.....	64	2	3	1910.6	24 32.9	24 33.0	"
19.00 S. 3.00 W.—N.E. cor. sec. 34.....	42	3	3	1910.8	25 19.5	25 15.2	D. E. Chartrand.
19.00 S. 3.00 W.—" 34.....	42	3	3	1910.8	25 12.2	25 13.9	"
19.00 S. 3.00 W.—" 34.....	42	3	3	1910.8	25 18.4	25 14.1	"
19.00 S. 3.00 W.—" 34.....	42	3	3	1910.8	25 11.5	25 14.2	"
19.00 S. 3.00 W.—" 34.....	42	3	3	1910.8	25 17.7	25 14.4	"



SESSIONAL PAPER No. 25b

TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
19.00 S. 3.00 W.—N.E. cor. sec. 34..	42	3	3	1910.8	25 08.3	25 11.0	D. E. Chartrand.
19.00 S. 3.00 W.—" 34..	42	3	3	1910.8	25 22.2	25 15.9	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.8	25 05.1	25 05.8	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.8	25 15.9	25 11.6	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.8	25 09.3	25 11.0	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.8	25 18.4	25 14.1	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.8	25 08.0	25 12.2	"
19.00 S. 3.00 W.—" 31..	42	3	3	1910.9	25 16.2	25 11.6	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 07.6	25 08.0	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 14.2	25 09.6	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 08.3	25 10.7	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 16.0	25 12.4	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 06.0	25 06.4	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 14.9	25 11.3	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 04.3	25 06.2	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 15.8	25 14.2	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 07.8	25 09.2	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 13.7	25 09.1	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 07.5	25 08.9	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 15.3	25 10.7	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 04.5	25 07.9	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 14.6	25 10.0	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 03.2	25 07.6	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 15.9	25 10.3	"
19.00 S. 3.00 W.—" 54..	42	3	3	1910.9	25 03.1	25 06.0	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 17.8	25 19.2	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 08.6	25 10.0	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 12.9	25 11.3	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 06.4	25 05.8	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 17.9	25 17.3	"
19.00 S. 3.00 W.—" 34..	42	3	3	1910.9	25 03.0	25 04.4	"
30.00 S. 5.00 E.—" 34..	42	3	3	1910.6	25 18.1	25 08.4	P. A. Carson.
30.00 S. 5.00 E.—" 34..	42	3	3	1910.6	24 56.4	24 59.7	"
At S.E. cor. sec. 1 .....	43	3	3	1910.6	24 44.3	24 43.4	"
" 1 .....	43	3	3	1910.6	24 40.3	24 37.4	"
15.00 W.—N.E. cor. sec. 9 .....	47	3	3	1909.5	25 07.8	25 14.0	A. L. McNaughton
2.00 N.—" 9 .....	47	3	3	1909.5	25 04.0	25 11.2	"
At N.E. cor. sec. 11. ....	48	3	3	1909.8	24 23.8	24 31.5	W. R. Reilly.
" 23 .....	48	3	3	1909.7	24 47.2	24 53.2	"
38.00 S.—N.E. cor. sec. 14 .....	48	3	3	1909.8	24 42.5	24 39.2	"
12.00 E.—" 11 .....	48	3	3	1909.8	24 34.2	24 40.9	"
18.00 S.—" 2 .....	48	3	3	1909.8	24 33.7	24 40.4	"
54.00 S.—" 7 .....	48	3	3	1909.8	24 39.4	24 41.1	"
75.00 S.—" 10 .....	48	3	3	1909.7	24 59.7	25 05.7	"
45.00 S.—" 27 .....	48	3	3	1909.7	24 51.7	24 52.7	"
66.00 S.—" 22 .....	48	3	3	1909.7	24 51.2	24 59.2	"
At N.E. cor. sec. 10 .....	48	3	3	1909.7	24 57.9	24 58.9	"
48.00 W.—N.E. cor. sec. 34 .....	48	3	3	1909.7	24 08.9	24 09.9	"
56.00 W.—" 31 .....	48	3	3	1909.7	24 15.9	24 14.9	"
70.00 W.—" 34 .....	48	3	3	1909.7	24 16.9	24 12.9	"
15.00 W.—" 32 .....	48	3	3	1909.7	24 37.7	24 47.7	"
66.00 S.—" 29 .....	48	3	3	1909.7	24 38.2	24 48.2	"
43.00 S.—" 19 .....	48	3	3	1909.7	24 42.1	24 46.1	"
At N.E. cor. sec. 32 .....	48	3	3	1909.7	24 33.3	24 43.3	"
" 17 .....	49	3	3	1909.9	24 34.0	24 34.0	"
20.00 E.—N.E. cor. sec. 8 .....	49	3	3	1910.6	24 44.1	24 44.7	P. A. Carson.
20.00 E.—" 8 .....	49	3	3	1910.7	24 34.1	24 40.9	"
20.00 E.—" 8 .....	49	3	3	1910.7	24 35.0	24 41.8	"
76.20 E.—N.W. cor. sec. 33 .....	56	3	3	1910.7	23 39.6	23 40.0	Wm. Christie.
81.50 E.—" 34 .....	56	3	3	1909.7	23 32.9	23 40.9	"
69.19 E.—" 36 .....	56	3	3	1909.7	23 41.3	23 45.3	"
55.00 W.—N.E. cor. sec. 35 .....	60	3	3	1909.4	23 59.0	23 58.7	A. Saint Cyr.
55.00 W.—" 35 .....	60	3	3	1909.4	23 34.9	23 43.6	"
75.00 W.—" 35 .....	64	3	3	1910.7	24 09.5	24 10.3	"
4.00 E. $\frac{1}{4}$ cor. S.E. by. 1. ....	39	4	3	1910.7	24 21.8	24 25.8	P. A. Carson.



TABLE No. 4.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
12.00 W.—S.E. cor. sec. 1.	39	4	3	1910.7	24 28.5	24 28.5	P. A. Carson.
5.00 S.—N.E. cor. sec. 8.	46	4	3	1909.7	23 18.4	23 22.4	A.L. McNaughton
19.00 S.—" " 17.	47	4	3	1909.7	24 17.8	"	"
5.00 S.—" " 9.	47	4	3	1909.7	24 10.8	24 08.8	"
10.00 E.—" " 7.	47	4	3	1909.7	23 15.8	23 19.8	"
72.00 S.—" " 13.	48	4	3	1909.8	24 36.5	24 31.2	W. R. Reilly.
38.00 S.—" " 1.	48	4	3	1909.8	24 29.0	24 36.7	"
50.00 S.—" " 36.	48	4	3	1909.7	24 04.2	24 11.7	"
34.95 E.—N.W. cor. sec. 33.	56	4	3	1909.7	22 36.1	22 39.6	Wm. Christie.
34.95 E.—" " 33.	56	4	3	1909.7	22 43.1	22 40.6	"
77.00 E.—" " 34.	56	4	3	1909.7	23 00.6	23 09.1	"
79.00 W.—N.E. cor. sec. 34.	60	4	3	1904.4	22 03.1	22 08.8	A. Saint Cyr.
75.00 E.—N.E. cor. sec. 31.	64	4	3	1910.7	24 04.3	24 04.3	"
50.00 N.—" " 19.	7	5	3	1908.6	20 21.7	20 28.9	C. F. Miles.
30.00 N.—" " 5.	25	5	3	1911.5	24 13.0	24 15.2	G. A. Bennett.
10.00 N.—S.E. cor. sec. 1.	39	5	3	1910.6	24 09.9	24 10.0	P. A. Carson.
10.00 N.—" " 1.	39	5	3	1910.6	24 19.7	24 17.8	"
12.00 N.—S.E. cor. sec. 1.	39	5	3	1910.6	24 13.8	24 11.9	D. E. Chartrand.
1.00 S.—N.E. cor. sec. 9.	46	5	3	1911.4	22 52.7	"	E. W. Hubbell.
14.00 S.—" " 23.	46	5	3	1911.4	23 31.1	23 34.5	"
At N.E. cor. sec. 7.	49	5	3	1910.7	20 47.2	20 42.0	P. A. Carson.
" " " "	49	5	3	1910.7	20 44.9	20 40.7	"
15.20 E.—N.W. cor. sec. 35.	56	5	3	1909.7	20 39.5	20 43.0	Wm. Christie.
40.03 E.—" " 35.	56	5	3	1909.7	20 56.0	20 54.0	"
67.00 E.—" " 35.	56	5	3	1909.7	20 29.9	20 39.9	"
58.61 E.—N.W. cor. sec. 33.	56	5	3	1909.7	21 09.5	21 07.5	"
12.15 E.—" " 34.	56	5	3	1909.7	20 52.2	21 00.2	"
56.00 W.—N.E. cor. sec. 34.	60	5	3	1909.4	22 01.6	22 12.5	A. Saint Cyr.
56.00 W.—" " 34.	60	5	3	1909.4	22 21.5	22 22.4	"
65.90 E.—N.E. " 32.	64	5	3	1910.7	23 26.2	23 29.2	"
At S.E. cor. sec. 5.	23	6	3	1911.8	21 04.4	21 00.4	C. Rinfret
15.00 W.—center sec. 24.	33	6	3	1910.6	23 04.0	22 57.5	P. A. Carson.
At centre sec. 24.	33	6	3	1910.6	22 46.3	22 55.4	"
3.00 N.—N.E. cor. sec. 34.	53	6	3	1911.7	21 00.7	20 59.7	E. W. Hubbell.
4.00 N.—S.E. " 5.	55	6	3	1911.7	20 52.5	20 48.9	"
1.07 E.—N.W. cor. sec. 31.	56	6	3	1909.7	22 38.6	22 37.4	Wm. Christie.
35.20 E.—" " 31.	56	6	3	1909.7	21 26.0	21 37.8	"
16.17 E.—" " 32.	56	6	3	1909.7	20 36.5	20 40.3	"
16.17 E.—" " 32.	56	6	3	1909.7	20 39.3	20 41.1	"
39.00 E.—" " 32.	56	6	3	1909.7	20 16.2	20 30.0	"
50.00 E.—" " 33.	56	6	3	1909.7	21 42.9	21 39.9	"
20.20 E.—" " 34.	56	6	3	1909.7	22 21.4	22 33.4	"
49.16 E.—N.W. " 34.	56	6	3	1909.7	22 43.9	22 36.9	"
8.74 E.—" " 35.	56	6	3	1909.7	22 12.6	22 22.6	"
23.00 E.—N.E. cor. sec. 34.	64	6	3	1910.7	25 33.1	25 34.1	A. Saint Cyr.
At N.E. cor. sec. 12.	1	7	3	1909.8	20 42.1	20 38.8	C. F. Miles.
55.90 E.—N.E. cor. sec. 11.	50	7	3	1910.8	21 35.5	"	E. W. Hubbell.
60.00 N.—" " 8.	52	7	3	1910.8	22 07.3	22 08.4	"
35.09 N.—" " 4.	53	7	3	1910.8	23 23.0	23 22.7	"
47.00 E.—S.E. cor. sec. 3.	55	7	3	1911.7	23 31.0	23 27.0	"
65.37 E.—N.W. " 32.	56	7	3	1909.6	25 33.3	25 35.4	Wm. Christie.
61.91 E.—" " 33.	56	7	3	1909.7	24 52.4	24 48.2	"
60.00 E.—" " 34.	56	7	3	1909.7	21 56.0	22 09.8	"
15.00 W.—N.E. cor. sec. 36.	60	7	3	1909.5	23 04.1	23 08.7	A. Saint Cyr.
40.00 W.—" " 33.	64	7	3	1910.8	25 36.0	25 37.1	"
At N.E. cor. sec. 31.	64	7	3	1910.8	25 25.5	25 26.6	"
1.00 N.—N.E. cor. sec. 17.	49	8	3	1910.8	22 24.9	22 24.0	E. W. Hubbell.
15.00 N.—" " 3.	50	8	3	1910.8	22 58.2	22 58.3	"
15.00 N.—" " 24.	51	8	3	1910.8	23 22.0	23 22.1	"
At N.E. cor. sec. 34.	51	8	3	1910.8	23 24.2	23 32.9	"
" " " 36.	51	8	3	1910.8	23 09.9	23 08.6	"
37.86 E.—N.W. cor. sec. 35.	56	8	3	1909.6	24 45.4	24 43.5	Wm. Christie.
10.00 E.—" " 36.	56	8	3	1909.6	25 45.2	25 55.3	"
55.25 E.—" " 33.	56	8	3	1909.6	25 49.0	25 55.1	"
18.20 E.—" " 34.	56	8	3	1909.6	25 45.3	25 41.4	"
50.29 E.—" " 34.	56	8	3	1909.6	24 37.8	24 49.9	"



SESSIONAL PAPER No. 25b

TABLE No. 4.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
34.00 W.—N.E. cor. sec. 35.....	60	8	3	1909.5	25 41.4	25 42.6	A. Saint Cyr.
54.00 W.—" " 35.....	60	8	3	1909.5	25 34.3	25 47.5	"
24.50 W.—" " 33.....	60	8	3	1909.5	25 25.2	25 38.4	"
55.00 W.—" " 31.....	64	8	3	1910.8	25 31.8	25 27.9	"
55.00 W.—" " 31.....	64	8	3	1910.8	24 25.1	24 28.2	"
N.E. cor. sec. 32.....	50	9	3	1911.9	23 57.6	.....	E. W. Hubbell.
62.50 E.—N.E. cor. sec. 21.....	51	9	3	1911.9	24 29.5	24 26.0	"
45.50 E.—" " 23.....	52	9	3	1911.8	24 30.4	24 26.2	"
5.00 S.—" " 26.....	53	9	3	1911.9	24 25.3	24 20.9	"
72.00 E.—N.W. cor. sec. 32.....	56	9	3	1909.6	23 17.1	23 22.2	Wm. Christie.
75.03 E.—" " 34.....	56	9	3	1909.6	23 21.3	23 27.4	"
15.00 W.—N.E. " 34.....	60	9	3	1909.6	23 52.5	23 58.4	A. Saint Cyr.
15.00 E.—" " 31.....	64	9	3	1910.8	24 30.8	24 29.5	"
At N.E. cor. sec. 33.....	21	10	3	1909.4	21 34.0	21 32.7	C. F. Miles.
At N.W. " 19.....	49	10	3	1911.5	24 40.0	24 44.1	E. W. Hubbell.
34.40 W.—N.E. cor. sec. 33.....	50	10	3	1911.9	24 23.9	24 18.4	"
30.00 W.—N.E. " 33.....	51	10	3	1911.9	23 38.9	23 34.4	"
32.55 E.—N.W. " 32.....	56	10	3	1909.6	24 49.0	24 52.9	Wm. Christie.
57.50 W.—N.E. " 35.....	60	10	3	1909.6	23 23.9	23 28.0	A. Saint Cyr.
At N.E. " 12.....	49	11	3	1911.4	24 20.0	.....	E. W. Hubbell.
20.00 S.—N.E. " 33.....	51	11	3	1911.9	22 17.7	22 13.2	"
At N.E. " 35.....	51	11	3	1911.7	22 19.3	22 15.3	"
8.55 E.—N.W. " 33.....	56	11	3	1909.6	25 23.8	25 31.7	Wm. Christie.
7.00 W.—N.E. " 32.....	60	11	3	1909.6	24 42.9	24 42.0	A. Saint Cyr.
40.02 N.—" " 9.....	49	12	3	1909.9	24 35.2	24 34.2	W. R. Reilly.
10.00 S.—" " 5.....	49	12	3	1909.9	24 24.5	24 31.5	"
40.00 N.—" " 10.....	49	12	3	1909.9	24 20.4	24 26.4	"
20.00 N.—" " 6.....	49	12	3	1909.9	24 23.8	24 21.8	"
At N.E. cor. sec. 23.....	49	12	3	1909.9	24 28.2	24 34.2	"
10.00 S.—N.E. cor. sec. 2.....	49	12	3	1909.9	24 27.6	24 27.6	"
10.00 N.—" " 7.....	49	12	3	1909.9	24 17.1	24 21.1	"
9.00 S.—" " 32.....	50	12	3	1910.9	24 16.7	24 17.1	E. W. Hubbell.
At N.E. cor. sec. 12.....	52	12	3	1911.7	24 04.9	24 01.9	"
67.00 E.—N.W. cor. sec. 34.....	56	12	3	1909.6	25 29.4	25 36.3	Wm. Christie.
10.00 W.—N.E. " 31.....	60	12	3	1909.6	25 24.8	35 26.9	A. Saint Cyr.
30.00 W.—" " 32.....	3	13	3	1909.7	20 44.6	.....	C. F. Miles.
At N.E. cor. sec. 19.....	50	13	3	1910.9	24 21.5	.....	E. W. Hubbell.
1.00 E.—S.E. cor. sec. 1.....	51	13	3	1910.9	24 24.2	24 23.6	"
17.00 S.—N.E. cor. sec. 15.....	52	13	3	1911.7	23 20.0	23 16.0	"
48.30 E.—N.W. " 36.....	56	13	3	1909.5	24 20.4	.....	Wm. Christie.
63.00 W.—N.E. " 31.....	60	13	3	1909.7	26 10.4	26 13.4	A. Saint Cyr.
At N.E. cor. sec. 33.....	64	13	3	1911.3	26 46.5	.....	"
" " ".....	64	13	3	1911.3	27 04.6	.....	"
" " ".....	64	13	3	1911.3	27 03.4	27 04.8	"
" " ".....	64	13	3	1911.3	26 57.8	27 00.2	"
At N.E. cor. sec. 31.....	52	14	3	1910.9	25 26.6	25 28.0	E. W. Hubbell.
53.35 E.—N.W. cor. sec. 33.....	56	14	3	1909.5	26 57.3	27 04.5	Wm. Christie.
At N.E. cor. sec. 31.....	64	14	3	1911.3	25 20.5	25 20.9	A. Saint Cyr.
At Post, sec. 1, lot 1, group 267.....	41	15	3	1910.7	24 27.7	24 26.7	P. A. Carson.
10.00 W.—Post, No. 1, lot 1, gr. 267.....	41	15	3	1910.7	24 29.0	24 30.5	"
17.32 E.—N.W., cor. sec. 32.....	56	15	3	1909.5	26 55.3	.....	Wm. Christie.
70.00 E.—" " 32.....	56	15	3	1909.5	27 06.6	27 16.2	"
18.40 E.—" " 33.....	56	15	3	1909.5	27 04.0	27 10.6	"
18.40 E.—" " 33.....	56	15	3	1909.5	27 16.6	27 17.7	"
57.93 E.—" " 33.....	56	15	3	1909.5	27 13.4	27 26.0	"
9.00 W.—N.E. cor. sec. 33.....	64	15	3	1911.3	26 29.4	26 30.8	A. Saint Cyr.
6.00 N.—9.00 W. $\frac{1}{4}$ cor. N. By. 6.....	47	16	3	1910.7	24 17.7	24 23.7	P. A. Carson.
At S.W. cor. sec. 6.....	52	16	3	1911.6	25 56.3	26 55.8	E. W. Hubbell.
60.63 S.—N.E. cor. sec. 24.....	53	16	3	1910.9	26 31.8	26 33.2	"
45.00 E.—N.W. " 32.....	56	16	3	1909.5	26 51.6	26 56.2	Wm. Christie.
42.79 E.—" " 33.....	56	16	3	1909.5	26 46.8	26 57.4	"
20.00 W.—N.E. cor. sec. 34.....	60	16	3	1909.8	25 01.1	25 03.8	A. Saint Cyr.
56.00 W.—" " 34.....	64	16	3	1911.3	25 37.0	.....	"
At $\frac{1}{4}$ cor. E. by sec. 12.....	47	17	3	1910.7	24 22.4	24 22.4	P. A. Carson.
At N.E. cor. sec. 31.....	53	17	3	1910.8	26 17.3	26 23.4	C. F. Miles.
17.00 N.—S.E. cor. sec. 4.....	56	17	3	1911.7	26 01.0	25 58.2	E. W. Hubbell.



TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912. 0.	
50.00 E.—N.W. cor. sec. 31.....	56	17	3	1909.4	26 23.5	26 22.4	Wm. Christie.
52.00 E.—" " 32.....	56	17	3	1909.4	25 56.6		
At N.E., cor. sec. 35.....	57	17	3	1911.7	26 35.1	26 31.3	E. W. Hubbell.
21.....	59	17	3	1911.6	26 03.5	26 01.0	" "
22.00 W.—N.E., cor. sec. 34.....	60	17	3	1909.8	25 14.0		A. Saint Cyr.
7.00 W.—" " 36.....	64	17	3	1911.4	25 34.7	25 29.7	" "
45.00 S.—" " 36.....	1	18	3	1909.7	20 01.9	20 00.9	C. F. Miles.
30.00 N.—" " 11.....	25	18	3	1909.5	22 01.2	22 03.6	" "
At N.E. cor. sec. 8.....	53	18	3	1910.8	26 40.3	26 45.6	" "
" " 34.....	53	18	3	1910.8	26 04.5	26 07.6	" "
" " 31.....	56	18	3	1909.4	25 57.1	26 00.0	Wm. Christie.
65.55 E.—N.W. cor. sec. 32.....	56	18	3	1909.4	25 37.4	25 48.3	" "
At N.E. cor. sec. 34.....	58	18	3	1911.6	26 16.5	26 16.0	E. W. Hubbell.
" " 10.....	59	18	3	1911.6	26 22.0	26 19.5	" "
25.00 W.—N.E. cor. sec. 33.....	60	18	3	1909.8	25 45.9		A. Saint Cyr.
At N.E. cor. sec. 32.....	60	18	3	1911.6	25 47.2	25 46.7	E. W. Hubbell.
78.00 W.—N.E. cor. sec. 33.....	64	18	3	1911.4	26 50.9	26 49.7	A. Saint Cyr.
10.00 W.—S.E. cor. sec. 3.....	55	19	3	1910.7	26 11.2	26 10.7	C. F. Miles.
67.00 E.—N.W. cor. sec. 32.....	56	19	3	1909.4	26 11.7	26 17.4	Wm. Christie.
26.65 S.—N.E. cor. sec. 20.....	58	19	3	1911.6	25 31.9	25 29.4	E. W. Hubbell.
At N.E. cor. sec. 36.....	60	19	3	1911.6	25 30.3	25 28.8	" "
" " 34.....	60	19	3	1911.6	25 17.9	25 18.4	" "
25.00 W.—N.E. cor. sec. 33.....	60	19	3	1909.9	25 35.4	25 38.4	A. Saint Cyr.
64.00 W.—" " 34.....	64	19	3	1911.4	26 51.0	26 53.8	" "
30.00 N.—" " 29.....	54	20	3	1910.7	25 00.2	25 00.2	C. F. Miles.
At N.E. cor. sec. 10.....	54	20	3	1910.8	25 04.1	25 09.2	" "
At N.E. cor. sec. 19.....	56	20	3	1910.7	26 10.7		C. F. Miles.
36.22 E.—N.W. cor. sec. 32.....	56	20	3	1909.4	26 42.8	26 38.5	Wm. Christie.
2.00 E.—" " 33.....	56	20	3	1909.4	26 23.3	26 29.0	" "
75.00 W.—N.E. cor. sec. 34.....	60	20	3	1909.9	25 15.2		A. Saint Cyr.
27.00 W.—" " 34.....	64	20	3	1911.4	26 00.1	26 02.5	" "
At N.E. cor. sec. 36.....	56	21	3	1910.7	33 13.5	33 09.9	C. F. Miles.
1.00 E.—N.W. cor. sec. 34.....	56	21	3	1909.4	26 09.6	26 11.3	Wm. Christie.
At N.E. cor. sec. 19.....	57	21	3	1910.7	25 25.9		C. F. Miles.
22.00 W.—N.E. cor. sec. 36.....	64	21	3	1911.5	26 35.9	26 30.5	A. Saint Cyr.
22.00 W.—" " 36.....	64	21	3	1911.5	26 16.9	26 21.0	" "
66.00 W.—" " 34.....	64	21	3	1911.5	26 21.2	26 19.8	" "
At N.E. cor. sec. 35.....	53	22	3	1910.8	24 35.5		C. F. Miles.
27.00 E.—N.W. cor. sec. 33.....	56	22	3	1909.4	26 15.7	26 17.9	Wm. Christie.
12.00 W.—N.E. " 32.....	64	22	3	1911.5	26 07.5	26 06.6	A. Saint Cyr.
At N.E. cor. sec. 14.....	3	23	3	1909.7	21 32.7	21 31.7	C. F. Miles.
10.00 N.—N.E. cor. sec. 15.....	7	23	3	1911.4	21 35.9		A. L. Cumming.
20.00 N.—" " 26.....	7	23	3	1911.5	21 37.2	21 34.3	" "
5.00 N.—" " 7.....	7	23	3	1911.5	21 26.4	21 28.5	" "
20.00 S.—" " 25.....	7	23	3	1911.5	21 40.9	21 40.0	" "
40.00 S.—" " 18.....	37	23	3	1910.8	24 13.7	24 13.8	P. A. Carson.
10.00 N.—S.E. cor. sec. 6.....	54	23	3	1909.9	24 25.3	24 27.3	G. J. Lonergan.
20.00 N.—N.E. cor. sec. 28.....	55	23	3	1910.8	26 10.7		C. F. Miles.
50.00 S.—" " 4.....	56	23	3	1910.8	26 32.0		" "
62.00 E.—N.W. " 32.....	56	23	3	1909.3	26 12.4	26 15.4	Wm. Christie.
At N.E. cor. sec. 33.....	57	23	3	1910.8	26 08.5	26 09.6	C. F. Miles.
69.00 W.—N.E. cor. sec. 33.....	64	23	3	1911.5	25 33.8	25 38.9	A. Saint Cyr.
15.00 N.—" " 14.....	7	24	3	1911.5	21 37.4	21 37.5	G. L. Cumming.
30.00 S.—" " 16.....	7	24	3	1911.5	21 41.4	21 35.5	" "
10.00 N.—S.E. " 4.....	7	24	3	1911.5	21 25.9	21 33.0	" "
8.00 N.—N.E. " 20.....	7	24	3	1911.5	21 30.3	21 30.5	" "
10.00 N.—S.E. " 2.....	54	24	3	1909.9	24 26.5	24 32.5	A. J. Lonergan.
63.00 E.—N.W. " 35.....	56	24	3	1909.3	26 14.8	26 18.0	Wm. Christie.
10.00 S.—N.E. " 29.....	57	24	3	1910.5	25 49.6	25 54.4	H. S. Holcroft.
30.00 S.—" " 21.....	58	24	3	1910.8	25 43.7	25 43.8	C. F. Miles.
30.00 W.—" " 33.....	64	24	3	1911.5	26 29.4	26 24.6	A. Saint Cyr.
30.00 W.—" " 33.....	64	24	3	1911.5	26 17.0	26 22.2	" "
30.00 W.—" " 33.....	64	24	3	1911.5	26 20.9	26 19.1	" "
At N.E. cor. sec. 32.....	14	25	3	1910.5	22 29.9	22 34.7	C. F. Miles.
" " 21.....	15	25	3	1910.5	23 53.6	23 54.0	" "
" " 25.....	37	25	3	1910.8	24 07.9		P. A. Carson.



SESSIONAL PAPER No. 25b

TABLE No. 4.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
At N.E. cor. sec. 25.....	37	25	3	1910.8	24 11.2	24 10.3	P. A. Carson.
35.00 N.—N.E. cor. sec. 26.....	37	25	3	1910.8	23 47.7	23 53.8	"
At N.E. cor. sec. 5.....	47	25	3	1910.7	24 17.2	24 19.2	"
15.00 W.—N.E. cor. sec. 18.....	48	25	3	1910.7	24 47.1	24 50.6	"
15.00 W.— " 18.....	48	25	3	1910.7	24 49.2	24 51.2	"
15.00 W.— " 18.....	48	25	3	1910.7	24 47.6	24 45.6	"
15.00 W.— " 18.....	48	25	3	1910.7	24 46.5	24 45.5	D. E. Chartrand.
15.00 W.— " 18.....	48	25	3	1910.7	24 43.5	24 43.5	"
15.00 W.— " 18.....	48	25	3	1910.7	24 36.4	24 36.4	P. A. Carson.
15.00 W.— " 18.....	48	25	3	1910.7	24 34.5	24 35.5	"
15.00 W.— " 18.....	48	25	3	1910.7	24 30.7	24 34.7	"
15.00 W.— " 18.....	48	25	3	1910.7	24 33.9	24 40.9	"
15.00 W.— " 18.....	48	25	3	1910.7	24 26.6	24 34.6	"
15.00 W.— " 18.....	48	25	3	1910.7	24 37.7	24 43.7	D. E. Chartrand.
15.00 W.— " 18.....	48	25	3	1910.7	24 37.3	24 43.3	"
15.00 W.— " 18.....	48	25	3	1910.7	24 37.1	24 44.1	"
15.00 W.— " 18.....	48	25	3	1910.7	24 40.8	24 46.3	"
15.00 W.— " 18.....	48	25	3	1910.7	24 38.9	24 40.9	"
15.00 W.— " 18.....	48	25	3	1910.7	24 41.6	24 42.1	"
15.00 W.— " 18.....	48	25	3	1910.7	24 39.0	24 39.5	"
15.00 W.— " 18.....	48	25	3	1910.7	24 38.8	24 38.8	"
15.00 W.— " 18.....	48	25	3	1910.7	24 39.4	24 39.4	"
15.00 W.— " 18.....	48	25	3	1910.7	24 41.0	24 41.0	"
62.00 E.—N.W. cor. sec. 32.....	56	25	3	1909.3	26 25.5	26 20.7	Wm. Christie.
33.00 E.—N.W. cor. sec. 33.....	56	25	3	1909.3	25 45.9	25 55.1	"
60.00 N.—N.E. " 23.....	57	25	3	1910.5	26 01.5	25 57.9	H. S. Holcroft.
At N.E. cor. sec. 27.....	57	25	3	1910.5	25 43.9	25 44.3	"
Near S.E. cor. sec. 31.....	63	25	3	1911.6	26 21.4	26 17.9	A. Saint Cyr.
64.00 W.—N.E. cor. sec. 36.....	64	25	3	1911.5	25 49.6	25 50.8	"
43.00 W.— " 33.....	64	25	3	1911.5	25 52.4	25 49.6	"
10.00 S. 30.00 W.—N.E. cor. sec. 19.....	40	26	3	1910.8	23 40.8	23 36.9	D. E. Chartrand.
" " " " " " " " " " " "	40	26	3	1910.8	23 43.6	23 40.7	P. A. Carson.
" " " " " " " " " " " "	40	26	3	1910.8	23 44.2	23 39.3	"
30.00 N.—S.E. cor. sec. 11.....	54	26	3	1909.8	24 42.1	24 42.1	G. J. Lonergan.
10.00 S.—N.E. " 31.....	55	26	3	1909.8	26 37.9	26 33.2	"
5.00 S.— " 32.....	55	26	3	1909.8	26 27.6	26 29.9	"
At N.E. cor. sec. 35.....	56	26	3	1909.3	25 53.0	25 57.2	Wm. Christie.
5.00 N.—N.E. cor. sec. 7.....	57	26	3	1910.8	25 21.1	25 19.8	C. F. Miles.
At N.E. cor. sec. 35.....	59	26	3	1910.8	26 00.7	26 00.4	C. F. Miles.
48.00 W.—N.E. cor. sec. 31.....	60	26	3	1910.2	25 23.4	25 30.6	A. Saint Cyr.
15.00 W.— " 35.....	60	26	3	1910.1	25 02.9	25 08.9	"
13.00 W.— " 34.....	61	26	3	1911.6	24 40.8	24 39.7	"
13.00 W.— " 34.....	64	26	3	1911.6	24 48.6	24 44.5	"
13.00 W.— " 34.....	64	26	3	1911.6	24 37.8	24 41.2	"
8.00 N.— " 7.....	65	26	3	1911.6	25 52.9	25 50.8	"
At ½ cor. N. by sec. 7.....	48	27	3	1910.7	25 26.6	25 29.6	P. A. Carson.
10.00 S.—N.E. cor. sec. 11.....	53	27	3	1909.9	25 40.4	25 39.4	G. J. Lonergan.
10.00 E.— " 35.....	55	27	3	1909.8	27 14.4	27 11.7	"
15.00 N.—S.E. " 1.....	56	27	3	1909.8	27 13.5	27 09.8	"
72.50 E.—N.W. " 36.....	56	27	3	1909.3	25 54.0	25 57.2	Wm. Christie.
30.25 W.—N.E. " 36.....	60	27	3	1910.2	25 15.4	25 20.1	A. Saint Cyr.
40.00 S.— " 24.....	14	28	3	1911.6	21 40.9	21 39.4	C. Rinfret.
3.00 N.— " 21.....	15	28	3	1911.7	22 40.9	22 38.1	"
20.00 N.— " 1.....	1	29	3	1909.6	21 40.9	21 42.0	C. F. Miles.
40.00 N.— " 9.....	14	1	4	1910.9	22 13.5	22 12.2	"
13.80 E.— " 8.....	43	1	4	1911.7	25 03.2	24 59.2	R. C. Purser.
20.00 S.— " 34.....	57	1	4	1909.8	25 21.2	25 21.2	G. J. Lonergan.
5.00 N.—S.E. " 3.....	58	1	4	1909.8	25 14.3	25 13.0	"
20.00 S.—N.E. " 31.....	62	1	4	1909.8	25 18.4	25 21.1	"
12.00 S.— " 25.....	62	1	4	1911.6	26 05.0	26 01.5	A. Saint Cyr.
12.00 S.— " 25.....	62	1	4	1911.6	26 18.6	26 12.1	"
12.00 S.— " 25.....	62	1	4	1911.6	26 18.5	26 13.0	"
12.00 S.— " 25.....	62	1	4	1911.6	26 00.2	26 03.7	"
5.00 N.—S.E. " 5.....	63	1	4	1909.8	25 29.0	25 31.7	G. J. Lonergan.
7.00 N.—N.E. " 25.....	63	1	4	1909.2	25 15.2	25 11.3	J. N. Wallace.
40.00 N.— " 12.....	63	1	4	1911.6	25 58.3	25 50.8	A. Saint Cyr.



TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
40.00 N.—N.E. cor. sec. 12	63	1	4	1911.6	25 46.2	25 46.7	A. Saint Cyr.
40.00 N.—" " 12	63	1	4	1911.6	25 51.1	25 48.6	"
2.30 S.—" " 24	65	1	4	1911.6	26 15.8	26 13.3	"
2.00 N.—" " 13	65	1	4	1911.6	26 04.2	26 01.7	"
2.00 N.—" " 13	65	1	4	1911.6	26 19.1	26 08.6	"
2.00 N.—" " 13	65	1	4	1911.6	26 01.1	26 06.6	"
2.00 N.—" " 13	65	1	4	1911.6	26 08.2	26 05.7	"
2.00 N.—" " 13	65	1	4	1911.6	26 00.9	26 06.4	"
39.00 N.—S.E. " 13	65	1	4	1909.3	25 48.6	25 51.8	J. N. Wallace.
5.00 N.—N.E. " 25	67	1	4	1909.3	26 31.0	26 25.2	"
61.21 W.—" " 35	68	1	4	1910.4	26 44.0	26 49.1	Wm. Christie.
19.00 W.—" " 32	68	1	4	1910.4	26 37.5	26 39.6	"
9.00 N.—S.E. " 25	69	1	4	1909.4	26 13.1	26 13.0	J. N. Wallace.
75.00 S.—N.E. " 1	69	1	4	1909.4	27 22.6	27 16.3	"
64.00 N.—S.E. " 1	71	1	4	1909.5	26 53.1	26 49.5	"
16.05 W.—N.E. " 33	72	1	4	1910.6	26 24.4	26 24.2	B. J. Saunders.
59.41 W.—" " 34	76	1	4	1910.7	27 44.9	27 46.9	Wm. Christie.
68.27 W.—" " 31	76	1	4	1910.7	27 11.5	27 11.5	"
80.70 S.—" " 1	77	1	4	1909.8	23 03.2	23 11.9	J. N. Wallace.
3.00 N.—" " 13	78	1	4	1909.8	27 10.4	27 10.1	"
7.00 N.—" " 25	78	1	4	1909.8	27 07.1	26 57.8	"
14.00 N.—" " 13	79	1	4	1909.8	26 54.3	26 49.0	"
5.00 N.—" " 1	80	1	4	1909.9	26 14.7	26 08.9	"
40.00 N.—N.E. " 24	80	1	4	1909.9	27 06.8	27 02.2	J. N. Wallace.
65.00 N.—" " 1	82	1	4	1910.5	28 04.5	28 08.3	"
47.00 N.—" " 12	83	1	4	1910.5	28 33.0	28 38.8	"
75.65 N.—S.E. " 25	83	1	4	1910.5	28 59.5	29 04.3	"
53.00 N.—" " 1	86	1	4	1910.6	27 34.0	27 39.1	"
64.00 N.—N.E. " 25	86	1	4	1910.6	27 41.8	27 46.9	"
33.84 N.—" " 13	87	1	4	1910.6	25 42.5	25 45.6	"
1.64 N.—" " 25	87	1	4	1910.6	27 24.1	27 29.2	"
5.06 W.—" " 35	88	1	4	1911.5	31 09.9	31 07.0	G. H. Blanchet.
72.31 N.—S.E. " 1	88	1	4	1910.6	28 10.4	28 14.5	J. N. Wallace.
77.24 N.—N.E. " 12	88	1	4	1910.6	28 29.3	28 35.4	"
26.00 N.—" " 12	89	1	4	1910.7	30 32.2	30 36.7	"
21.61 N.—" " 36	89	1	4	1910.7	29 48.2	29 49.7	"
53.00 N.—" " 24	90	1	4	1910.7	26 05.5	"	"
10.00 N.—" " 1	91	1	4	1910.8	26 22.2	"	"
45.00 N.—" " 24	91	1	4	1910.8	26 19.3	26 23.4	"
5.00 S.—" " 36	91	1	4	1910.8	25 49.3	25 48.4	"
70.00 N.—" " 12	92	1	4	1910.8	27 29.1	27 25.2	"
70.00 N.—" " 12	92	1	4	1910.8	27 19.7	27 23.8	"
70.00 N.—" " 12	92	1	4	1910.8	27 23.7	"	"
24.23 W.—N.E. " 36	92	1	4	1911.8	28 16.7	28 10.7	J. B. McFarlane.
59.00 N.—" " 24	93	1	4	1910.8	30 18.5	30 14.2	J. N. Wallace.
59.00 N.—" " 24	93	1	4	1910.8	30 19.7	30 18.4	"
59.00 N.—" " 24	93	1	4	1910.8	30 31.3	30 30.0	"
32.00 N.—" " 24	94	1	4	1910.9	30 57.1	30 52.5	"
32.00 N.—" " 36	94	1	4	1910.9	30 49.1	30 47.0	"
32.00 N.—" " 36	94	1	4	1910.9	30 48.3	30 49.7	"
3.00 N.—N.E. cor. sec 1	95	1	4	1910.9	31 03.8	"	J. N. Wallace.
24.93 N.—" " 24	96	1	4	1911.5	31 13.3	31 15.4	J. B. McFarlane.
1.27 N.—" " 1	97	1	4	1911.5	31 20.8	31 22.9	"
68.67 N.—" " 1	97	1	4	1911.5	31 05.1	31 07.2	"
53.44 N.—" " 12	97	1	4	1911.5	31 14.8	31 18.0	"
51.07 N.—" " 13	97	1	4	1911.5	31 13.3	31 13.5	"
2.20 N.—" " 24	97	1	4	1911.5	31 15.0	31 16.2	"
77.73 N.—" " 24	97	1	4	1911.5	31 31.3	31 32.5	"
10.33 N.—" " 12	98	1	4	1911.5	31 21.6	"	"
76.46 N.—" " 24	98	1	4	1911.5	30 53.0	30 57.2	"
31.96 N.—" " 1	99	1	4	1911.5	31 16.7	31 18.9	"
9.73 N.—" " 13	99	1	4	1911.5	30 22.3	30 22.5	"
29.77 N.—" " 1	100	1	4	1911.6	30 01.8	30 01.7	"
29.77 N.—" " 1	100	1	4	1911.6	29 58.5	29 58.4	"
13.75 N.—" " 12	100	1	4	1911.6	30 09.9	30 09.8	"
45.20 N.—" " 24	100	1	4	1911.6	32 11.3	32 10.2	"



SESSIONAL PAPER No. 25b

TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
37.26 N.—N.E. cor. sec. 36.....	100	1	4	1911.6	32 15.2	32 16.7	J. B. McFarlane.
23.05 N.—" 12.....	101	1	4	1911.6	32 03.7	32 02.2	"
27.67 N.—" 36.....	101	1	4	1911.6	33 08.7	33 07.2	"
51.72 N.—" 25.....	101	1	4	1911.6	33 27.4	33 25.9	"
7.67 N.—" 1.....	102	1	4	1911.6	33 44.4	33 40.9	"
69.72 N.—" 1.....	102	1	4	1911.7	33 33.6	33 31.8	"
2.31 N.—" 25.....	102	1	4	1911.7	31 41.9	31 39.1	"
69.72 N.—" 1.....	102	1	4	1911.7	33 33.3	33 30.5	"
23.85 N.—" 25.....	102	1	4	1911.7	31 40.0	31 38.2	"
57.38 N.—" 13.....	102	1	4	1911.7	31 48.3	31 44.5	"
74.64 N.—" 1.....	103	1	4	1911.7	31 26.3	31 22.3	"
71.60 N.—" 13.....	103	1	4	1911.7	31 19.8	31 15.8	"
30.58 N.—" 24.....	103	1	4	1911.7	31 17.2	31 14.2	"
78.70 N.—" 36.....	104	1	4	1911.7	30 44.2	30 39.2	"
13.12 N.—" 1.....	104	1	4	1911.7	31 19.0	31 14.0	"
16.84 N.—" 12.....	104	1	4	1911.7	31 07.8	31 02.8	"
55.33 N.—" 13.....	104	1	4	1911.7	31 08.3	31 04.3	"
15.64 N.—" 13.....	104	1	4	1911.7	31 11.1	31 07.1	"
75.64 N.—" 24.....	105	1	4	1911.7	30 45.1	30 41.1	"
47.11 N.—" 1.....	105	1	4	1911.7	30 44.0	30 42.0	"
7.00 S.—" 2.....	62	2	4	1909.8	24 59.2	25 00.9	G. J. Lonergan.
50.00 N.—" 23.....	62	2	4	1909.8	24 56.1	24 57.8	"
27.00 W.—" 35.....	68	2	4	1910.4	26 52.4	26 58.5	Wm. Christie.
26.36 W.—" 33.....	68	2	4	1910.4	27 15.5	27 21.6	"
43.06 W.—" 31.....	68	2	4	1910.4	27 09.0	27 13.1	"
0.04 W.—" 35.....	72	2	4	1910.7	27 40.7	27 44.7	B. J. Saunders.
68.04 W.—" 36.....	76	2	4	1910.7	26 52.6	26 56.1	Wm. Christie.
68.27 W.—" 32.....	76	2	4	1910.7	26 47.4	26 45.9	"
36.69 W.—" 35.....	92	2	4	1911.8	29 19.6	29 15.6	J. B. McFarlane.
36.17 W.—" 35.....	92	2	4	1911.8	29 02.0	29 00.0	"
60.59 W.—" 34.....	92	2	4	1911.8	28 15.3	28 11.3	"
42.09 W.—" 33.....	92	2	4	1911.8	28 05.2	28 03.2	"
At N.E. cor. sec. 7.....	3	3	4	1910.4	21 59.3	22 05.4	C. F. Miles.
60.00 N.—N.E. cor. sec. 7.....	3	3	4	1909.6	23 08.2	.....	"
On trial line 50.00 N.—S.E. cor. 3.....	7	3	4	1911.4	21 52.5	21 57.9	E. S. Martindale.
20.00 N.—N.E. cor. sec. 8.....	53	3	4	1910.5	26 18.3	26 22.1	G. J. Lonergan.
10.00 N.—" 31.....	61	3	4	1911.7	25 36.0	25 33.0	C. F. Miles.
35.00 N.—" 17.....	61	3	4	1911.8	26 22.9	26 18.9	"
10.00 S.—" 34.....	63	3	4	1910.6	25 46.0	25 48.1	G. J. Lonergan.
20.00 S.—" 4.....	64	3	4	1910.6	25 46.1	25 48.2	"
11.91 W.—" 35.....	68	3	4	1910.5	26 55.9	26 59.7	Wm. Christie.
61.97 W.—" 31.....	68	3	4	1910.5	26 12.6	26 17.4	"
3.58 W.—" 36.....	72	3	4	1910.8	28 26.0	.....	B. J. Saunders.
36.95 W.—" 35.....	76	3	4	1910.7	26 50.6	26 52.6	Wm. Christie.
36.21 W.—" 34.....	76	3	4	1910.7	26 53.8	26 52.8	"
65.23 W.—" 36.....	76	3	4	1910.7	27 32.2	27 33.7	"
33.30 W.—" 35.....	88	3	4	1911.5	29 16.4	29 16.6	G. H. Blanchet.
64.17 W.—" 35.....	92	3	4	1911.8	31 21.3	31 15.1	J. B. McFarlane.
62.00 W.—" 34.....	92	3	4	1911.8	31 24.1	31 18.9	"
6.14 W.—" 33.....	92	3	4	1911.8	31 24.0	31 27.8	"
43.70 W.—" 33.....	92	3	4	1911.8	30 48.3	30 43.1	"
43.70 W.—" 33.....	92	3	4	1911.8	30 40.0	30 35.8	"
On trial line 5.00 N.—N.E. cor. 8.....	7	4	4	1911.4	22 11.1	22 14.5	E. S. Martindale.
At N.E. cor. sec. 4.....	11	4	4	1911.8	21 55.8	21 50.8	G. A. Bennett.
At " 1.....	16	4	4	1911.8	22 39.6	22 34.6	"
15.00 S.—N.E. cor. sec. 29.....	61	4	4	1909.7	26 53.1	26 57.1	G. J. Lonergan.
30.00 E.—" 33.....	62	4	4	1909.7	26 54.8	26 51.8	"
20.00 S.—" 35.....	63	4	4	1910.6	27 25.2	.....	"
58.72 W.—" 34.....	68	4	4	1910.5	26 58.3	27 03.1	Wm. Christie.
75.00 W.—" 32.....	68	4	4	1910.5	26 19.1	26 23.9	"
73.43 W.—" 35.....	72	4	4	1910.8	27 55.5	27 55.1	B. J. Saunders.
12.51 W.—N.E. cor. sec. 35.....	76	4	4	1910.7	27 27.7	27 27.7	Wm. Christie.
62.56 W.—" 32.....	76	4	4	1910.7	27 24.9	.....	"
41.11 W.—" 36.....	92	4	4	1911.9	31 39.7	31 33.2	J. B. McFarlane.
13.03 W.—" 34.....	92	4	4	1911.9	31 42.9	31 38.4	"
On trial line at N.E. cor. sec. 9.....	7	5	4	1911.5	22 50.3	22 51.4	E. S. Martindale.







SESSIONAL PAPER No. 25b

TABLE No. 4.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1910-0	
20.00 W.—N.E. cor. sec. 35.....	65	12	4	1910.6	27 11.7	27 11.8	G. J. Lonergan.
2.00 N.—S.E. cor. sec. 2.....	66	12	4	1910.6	27 14.3	27 13.9	"
60.25 W.—N.E. " 35.....	68	12	4	1910.6	28 00.6	28 03.7	Wm. Christie.
13.21 W.—" 32.....	68	12	4	1910.6	28 07.4	28 09.0	"
Athabaska River, Big Cascades E. side of river.....	87	12	4	1910.4	30 55.0	30 56.1	J. A. Coté.
" " ".....	87	12	4	1910.4	30 46.5	30 48.6	C. Engler.
" " ".....	87	12	4	1910.4	29 59.2	30 03.3	"
Fort Smith.....	127	12	4	1910.6	32 55.1	32 56.2	J. A. Coté.
" " ".....	127	12	4	1910.6	32 46.9	32 57.5	"
" " ".....	127	12	4	1910.6	32 47.1	32 48.7	"
" " ".....	127	12	4	1910.6	33 08.1	33 07.2	"
" " ".....	127	12	4	1910.6	32 53.7	32 55.8	"
" " ".....	127	12	4	1910.6	32 55.2	33 01.3	"
" " ".....	127	12	4	1910.6	32 51.4	32 52.5	"
" " ".....	127	12	4	1910.5	33 04.6	33 08.0	"
" " ".....	127	12	4	1910.5	32 58.7	33 07.1	"
" " ".....	127	12	4	1910.5	32 59.2	33 04.6	"
" " ".....	127	12	4	1910.6	33 07.7	33 06.8	"
" " ".....	127	12	4	1910.6	32 55.9	32 58.0	"
" " ".....	127	12	4	1910.6	32 57.1	33 02.2	"
" " ".....	127	12	4	1910.6	32 58.0	32 57.6	"
" " ".....	127	12	4	1910.6	33 08.7	33 05.8	"
" " ".....	127	12	4	1910.5	33 07.9	33 11.3	"
" " ".....	127	12	4	1910.5	33 13.8	33 14.2	"
" " ".....	127	12	4	1910.5	33 10.6	33 19.0	"
" " ".....	127	12	4	1910.5	32 52.1	33 01.5	"
" " ".....	127	12	4	1910.5	32 48.3	32 51.7	"
" " ".....	127	12	4	1910.5	33 10.1	33 05.5	"
" " ".....	127	12	4	1910.5	33 08.1	33 17.5	"
" " ".....	127	12	4	1910.5	32 49.9	32 55.8	"
" " ".....	127	12	4	1910.5	32 55.5	32 57.9	"
" " ".....	127	12	4	1910.5	33 01.0	33 02.4	"
" " ".....	127	12	4	1910.5	32 54.0	33 03.9	"
" " ".....	127	12	4	1910.5	32 53.1	32 59.5	"
" " ".....	127	12	4	1910.5	32 53.4	32 55.3	"
" " ".....	127	12	4	1910.5	33 11.4	33 09.8	"
" " ".....	127	12	4	1910.5	32 55.4	33 05.8	"
" " ".....	127	12	4	1910.6	32 52.4	32 59.5	"
" " ".....	127	12	4	1910.6	32 51.2	32 54.8	"
" " ".....	127	12	4	1910.6	33 12.2	33 08.3	"
" " ".....	127	12	4	1910.6	32 54.4	33 01.5	"
Centre L.S. 7, sec. 4.....	2	13	4	1911.4	22 19.1	22 19.9	P. B. Street.
0.75 N.E.—N.E. cor. sec. 10.....	2	13	4	1911.4	22 31.5	22 30.3	"
0.75 N.E.—" " 10.....	2	13	4	1911.4	22 32.5	22 31.3	"
Centre of E. by section 26.....	61	13	4	1908.5	27 15.5	27 27.8	G. J. Lonergan.
10.00 S.—N.E. cor. sec. 33.....	63	13	4	1909.7	27 02.0	27 05.0	"
15.00 W.—" " 11.....	64	13	4	1909.7	27 18.9	27 19.9	"
11.00 N.— $\frac{1}{4}$ sec. cor. E. by 16.....	2	14	4	1911.5	22 19.8	22 12.9	P. B. Street.
11.00 N.— $\frac{1}{4}$ " " 16.....	2	14	4	1911.5	22 16.7	22 17.8	"
12.00 S.—N.E. cor. sec. 9.....	2	14	4	1911.5	22 06.1	22 05.2	"
Athabaska River							
Below Boiler Rapids.....	87	14	4	1910.4	31 56.1	31 58.2	C. Engler.
47.66 N.—N.E. cor. sec. 33.....	1	15	4	1911.9	22 53.3	22 53.8	P. B. Street.
12.00 S.—" " 11.....	64	15	4	1909.7	26 48.6	26 49.6	G. J. Lonergan.
42.69 W.—" " 32.....	88	15	4	1911.9	31 13.9	.....	G. H. Blanchet.
50.00 W.—" " 31.....	88	15	4	1911.9	31 09.0	.....	"
45.00 S.—" " 5.....	26	16	4	1911.7	24 02.9	24 00.5	C. Rinfret.
At $\frac{1}{4}$ sec. cor. E. by sec. 18.....	46	16	4	1910.9	25 26.6	25 29.0	P. R. A. Belanger
63.90 W.—N.E. cor. sec. 31.....	88	16	4	1912.0	29 48.5	29 45.8	G. H. Blanchet.
At N.E. cor. sec. 24.....	26	17	4	1911.7	24 22.0	.....	C. Rinfret.
43.22 E.—N.E. cor. sec. 23.....	41	17	4	1909.6	25 01.0	.....	H. S. Holcroft.
43.22 " " 23.....	41	17	4	1909.6	24 53.1	24 58.2	"
38.00 W. 8.00 N.—N.E. cor. 13.....	41	17	4	1909.6	24 47.9	25 01.0	"
At N.E. cor. sec. 3.....	42	17	4	1909.6	25 09.4	25 08.5	"
" 3.....	42	17	4	1909.6	24 52.7	25 04.8	"







SESSIONAL PAPER No. 25b

TABLE No. 4—Continued.

Place	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
71.11 N. 67.63 E.—N.E. cor. sec. 7.	66	22	4	1910.8	27 58.7	28 00.4	J. A. Coté.
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 12.0	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 07.3	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 15.0	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 08.5	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 12.3	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 04.9	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 12.6	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 06.5	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 14.0	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 05.5	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 11.7	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 05.5	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.8	28 10.2	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.8	28 03.8	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.8	28 11.7	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.8	27 55.9	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.8	28 12.7	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.8	28 03.2	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.8	28 07.5	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.8	28 02.2	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.8	28 10.3	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.8	28 02.3	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 07.4	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 00.2	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 04.1	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 03.9	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 11.6	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 06.5	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 13.0	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 03.2	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 10.5	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 03.5	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 09.5	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	27 59.4	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 13.5	"
71.11 N. 67.63 E.—N.E. cor. sec. 7.	66	22	4	1910.9	28 05.5	28 05.9	J. A. Coté.
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 12.9	"
71.11 N. 67.63 E.—"	7..	66	22	4	1910.9	28 05.3	"
10.00 N.—S.E. cor. sec. 15.	69	23	4	1910.7	28 16.1	28 18.1	G. J. Lonergan.
E. By. sec. 33	61	24	4	1908.7	28 40.4	28 47.9	"
40.00 E.—N.E. cor. sec 11.	36	25	4	1911.7	25 31.9	25 32.9	G. A. Bennett.
40.00 E.—"	11.	36	25	4	1911.7	25 26.8	"
40.00 E.—"	11.	36	25	4	1911.7	25 31.2	"
10.00 S.—N.W.	19.	62	25	4	1909.9	27 13.4	G. J. Lonergan.
10.00 N.—N.E.	26.	62	26	4	1909.9	27 12.1	"
10.00 N.—S.E.	1.	63	26	4	1909.9	27 03.4	"
50.00 S.—N.E.	29.	50	27	4	1911.5	27 44.2	"
10.00 N.—S.E.	31.	53	27	4	1910.4	27 49.7	"
17.00 S.—N.E.	7.	29	4	1911.8	24 37.5	24 33.5	P. B. Street.
61.40 S.—"	11.	3	30	4	1908.8	23 28.2	W. H. Young.
31.00 W.— $\frac{1}{4}$ cor. S. By. sec. 1	7	30	4	1911.8	24 48.5	24 45.5	P. B. Street.
Travers of Fish L. in sec. 36.	4	1	5	1911.8	24 37.2	24 33.2	"
35.00 W.—N.E. cor. sec. 7.	5	1	5	1910.9	25 39.8	25 40.2	J. L. Lang.
36.00 N.—"	19.	5	1	1910.9	25 49.8	25 53.0	"
At N.E. cor. sec. 9.	13	1	5	1909.5	24 00.2	24 06.8	W. A. Scott.
45.00 E.—N.E. cor. sec. 8.	13	1	5	1909.5	24 05.9	24 00.0	"
50.00 S.—"	17.	13	1	1909.5	24 01.4	24 08.0	"
55.00 E.—"	7.	13	1	1909.5	24 04.8	24 01.4	"
At	8	13	1	1909.5	24 01.2	24 00.8	"
35.00 E.—"	8.	13	1	1909.5	23 57.7	24 02.8	"
At	19.	13	1	1909.5	23 42.0	23 41.6	"
30.00 N.—"	19	13	1	1909.4	24 00.6	23 57.0	"
62.00 W.—"	7.	13	1	1909.5	23 58.3	24 04.4	"
10.00 S.—"	18.	13	1	1909.5	24 06.8	24 03.4	"
35 21 E.—"	31.	80	1	1910.6	29 29.7	29 30.8	A. H. Hawkins.



TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DEGLINATION.		Observer.
					Obs'd.	Reduced to 1912-0	
At N.E. cor. sec. 36.....	80	1	5	1910.7	30 08.2	30 07.0	A. H. Hawkins.
15.00 S.—" 36.....	81	1	5	1911.4	29 51.9	29 54.7	T. H. Plunkett.
At $\frac{1}{4}$ Post—E. by. sec. 1.....	83	1	5	1911.4	29 57.8	29 58.6	"
33.00 N.—N.E. cor. sec. 12.....	84	1	5	1911.4	30 51.3	30 52.1	"
At $\frac{1}{4}$ Post—E. by. sec. 24.....	84	1	5	1911.4	30 43.6	30 42.4	"
78.50 W.—N.E. cor. sec. 36.....	84	1	5	1911.3	29 48.9	29 49.3	A. H. Hawkins.
12.00 S.—" 36.....	85	1	5	1911.4	29 55.1	29 55.5	T. H. Plunkett.
3.00 S.—" 13.....	87	1	5	1911.4	30 33.7	30 35.1	"
At $\frac{1}{4}$ Post E. by. sec. 24.....	88	1	5	1911.5	30 44.1	30 49.2	"
At N.E. " 13.....	90	1	5	1911.5	31 45.6	31 47.7	"
At N.E. cor. sec. 24.....	91	1	5	1911.5	30 58.1	31 02.2	"
" " 13.....	92	1	5	1911.5	30 33.0	30 32.2	"
10.00 S.—N.E. cor. sec. 24.....	94	1	5	1911.5	30 33.2	30 36.4	"
20.00 S. $\frac{1}{4}$ Post E. by. sec. 36.....	95	1	5	1911.5	31 29.0	31 31.2	"
10.00 S.—" 24.....	96	1	5	1911.5	30 46.2	30 45.4	"
5.00 N.—N.E. cor. sec. 24.....	99	1	5	1911.6	30 44.0	.....	"
20.00 S.—" 1.....	100	1	5	1911.6	30 58.0	30 57.9	"
At $\frac{1}{4}$ Post—E. by. sec. 36.....	100	1	5	1911.6	31 26.4	31 25.3	"
" " 25.....	103	1	5	1911.6	31 45.1	31 42.6	"
10.00 S.— $\frac{1}{4}$ Post E. by sec. 13.....	104	1	5	1911.6	32 01.9	31 59.4	"
15.00 N.—N.E. cor. sec. 36.....	108	1	5	1911.6	32 54.5	.....	"
" " 13.....	108	1	5	1911.6	33 00.1	32 57.6	"
5.68 S.— $\frac{1}{4}$ Post E. by sec. 13.....	109	1	5	1911.6	33 01.3	32 58.1	"
20.00 N.—" 24.....	110	1	5	1911.7	32 46.8	32 43.8	"
6.00 N.—" 12.....	110	1	5	1911.7	33 08.4	33 04.4	"
60.00 S.—N.E. cor. sec. 1.....	13	2	5	1909.5	24 09.3	24 13.9	W. A. Scott.
20.00 S.—" 12.....	13	2	5	1909.5	24 10.9	24 11.5	"
60.00 S.—" 12.....	13	2	5	1909.5	23 59.5	24 12.1	"
75.00 S.—" 13.....	13	2	5	1909.5	24 08.0	24 09.6	"
At " 12.....	13	2	5	1909.5	23 54.1	.....	"
32.00 S.—" 5.....	13	2	5	1909.9	24 02.4	24 02.2	"
62.00 S.—" 8.....	13	2	5	1909.9	24 03.9	24 06.5	"
15.00 S.—" 8.....	13	2	5	1909.9	24 05.3	.....	"
60.00 N.—S.E. cor. sec. 30.....	14	2	5	1909.5	23 14.9	.....	Jas. Warren.
36.00 N.—N.W. " 19.....	14	2	5	1909.5	23 22.6	23 16.2	"
At N.E. " 31.....	14	2	5	1909.5	23 15.7	23 20.3	"
50.00 N.—S.E. " 31.....	14	2	5	1909.5	23 20.8	.....	"
25.00 N.—N.E. " 13.....	14	2	5	1909.4	23 44.6	23 49.9	"
35.00 E.—N.W. " 20.....	14	2	5	1909.4	23 15.9	23 23.8	"
15.00 N.—S.E. " 24.....	14	2	5	1909.4	23 11.8	23 14.7	"
4.00 E.—N.W. " 19.....	14	2	5	1909.4	23 17.5	23 21.4	"
45.00 W.—N.E. " 32.....	14	2	5	1909.5	23 17.6	23 25.2	"
50.00 N.—N.W. " 19.....	14	2	5	1909.5	23 11.6	23 20.2	"
At N.E. " 31.....	14	2	5	1909.5	23 26.8	23 25.4	"
50.00 N.—N.W. " 19.....	14	2	5	1909.5	23 33.9	23 28.5	"
10.00 S.—" 18.....	15	2	5	1909.5	23 13.0	23 17.6	"
10.00 S.—" 18.....	15	2	5	1909.5	23 39.4	23 34.5	"
35.00 S.—" 7.....	15	2	5	1909.5	23 33.0	23 29.6	"
40.00 N.—N.W. cor. sec. 1.....	15	2	5	1909.5	23 23.3	.....	Jas. Warren.
At N.E. cor. sec. 35.....	80	2	5	1910.6	29 29.7	29 32.8	A. H. Hawkins.
79.00 E.—N.E. cor. sec. 35.....	80	2	5	1910.6	29 07.3	.....	"
35.00 W.—" 36.....	84	2	5	1911.3	30 24.2	30 25.3	"
43.00 W.—" 35.....	84	2	5	1911.3	30 24.2	30 27.3	"
47.50 W.—" 33.....	84	2	5	1911.4	30 10.8	30 10.6	"
5.00 W.—" 31.....	84	2	5	1911.4	30 27.5	30 25.3	"
36.00 W.—" 36.....	84	2	5	1911.3	30 09.0	30 11.1	"
36.00 W.—" 36.....	84	2	5	1911.3	30 24.0	30 25.1	"
69.79 W.—" 35.....	84	2	5	1911.3	30 05.1	30 09.2	"
36.67 W.—" 33.....	84	2	5	1911.4	30 10.5	30 10.3	"
69.83 W.—" 31.....	84	2	5	1911.4	30 03.2	30 01.0	"
24.80 S.—" 22.....	6	3	5	1908.5	24 41.9	24 49.2	W. H. Young.
At N.E. cor. sec. 7.....	9	3	5	1909.6	23 54.0	24 00.1	W. A. Scott.
" " 6.....	9	3	5	1909.6	23 51.5	24 00.6	"
40.00 N.—N.E. cor. sec. 6.....	9	3	5	1909.6	24 00.5	23 52.1	"
20.00 S.—" 6.....	9	3	5	1909.5	24 01.2	24 02.1	"
At N.E. cor. sec. 30.....	10	3	5	1909.7	23 45.8	23 44.8	"



SESSIONAL PAPER No. 25b

TABLE No. 4.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
65°00 N.—N.E. cor. sec. 19.....	10	3	5	1909.7	24 00'5	23 57'5	W. A. Scott.
45°00 N.—" 19.....	10	3	5	1909.7	23 50'6	23 59'6	"
20°00 N.—" 19.....	10	3	5	1909.7	24 00'7	23 58'7	"
70°00 N.—" 18.....	10	3	5	1909.7	23 51'7	24 03'7	"
50°00 N.—" 7.....	10	3	5	1909.6	23 49'8	24 00'1	"
50°00 N.—" 18.....	10	3	5	1909.7	23 59'3	23 53'3	"
30°00 N.—" 7.....	10	3	5	1909.6	23 54'8	23 51'1	"
21°00 W.—" 7.....	10	3	5	1909.6	23 56'0	24 05'3	"
36°00 S.—" 36.....	12	3	5	1909.9	24 04'8	24 08'4	"
At N.E. cor. sec. 25.....	12	3	5	1909.9	24 08'2	24 07'8	"
12°00 S.—N.E. cor. sec. 36.....	12	3	5	1909.9	24 08'5	24 07'1	"
30°00 N.—" 30.....	13	3	5	1909.5	23 48'5	23 41'9	"
At N.E. cor. sec. 29.....	13	3	5	1909.5	23 38'3	23 46'7	"
40°00 W.—N.E. cor. sec. 34.....	13	3	5	1909.5	23 49'2	23 44'3	"
40°00 N.—" 29.....	13	3	5	1909.5	23 39'0	23 46'4	"
At N.E. cor. sec. 29.....	13	3	5	1909.5	23 45'7	23 32'6	"
" 34.....	13	3	5	1909.5	23 38'2	23 44'2	"
7°00 N.—N.E. cor. sec. 25.....	14	3	5	1909.5	23 57'0	23 53'6	Jas. Warren.
At N.E. cor. sec. 25.....	15	3	5	1909.5	23 30'4	23 36'0	"
10°00 N.—S.E. cor. sec. 36.....	15	3	5	1909.5	24 50'9	24 58'5	"
10°00 S.—N.E. cor. sec. 5.....	63	3	5	1911.3	27 58'1	27 55'5	G. J. Lonergan.
64°49 E.—" 32.....	80	3	5	1910.6	31 32'6	31 35'7	A. H. Hawkins.
66°00 E.—" 34.....	80	3	5	1910.6	31 20'6	31 27'7	"
38°48 W.—" 36.....	84	3	5	1911.4	30 00'4	29 58'2	"
10°00 W.—" 35.....	84	3	5	1911.4	30 15'8	30 16'6	"
71°00 W.—" 32.....	84	3	5	1911.4	31 04'1	31 03'9	"
At N.E. cor. sec. 34.....	5	4	5	1909.6	24 31'6	24 31'6	W. H. Young.
44°00 S.—N.E. cor. sec. 35.....	5	4	5	1910.8	25 14'3	25 15'4	J. L. Lang.
12°00 S.—" 26.....	5	4	5	1910.8	25 00'7	25 04'8	"
60°00 S.—" 26.....	5	4	5	1910.8	24 59'0	25 02'1	"
10°00 W.—" 23.....	5	4	5	1910.8	25 07'4	25 08'5	"
40°00 W.—" 23.....	5	4	5	1910.8	24 58'0	24 58'0	"
10°00 S.—" 27.....	5	4	5	1910.8	24 59'6	25 01'7	"
20°00 N.—" 22.....	5	4	5	1910.8	25 08'0	25 07'1	"
20°00 E.—" 22.....	5	4	5	1910.8	25 07'5	25 08'6	"
45°00 E.—" 21.....	5	4	5	1910.8	25 03'6	25 04'7	"
35°00 W.—" 21.....	5	4	5	1910.8	25 02'2	25 01'3	"
35°00 N.—" 20.....	5	4	5	1910.8	24 59'5	24 59'6	"
70°00 N.—" 20.....	5	4	5	1910.8	25 00'9	24 59'6	"
39°00 W.—" 19.....	5	4	5	1911.6	24 23'4	24 23'9	P. B. Street.
12°50 N.—" 17.....	5	4	5	1911.7	24 15'2	24 12'4	"
At N.E. cor. sec. 24.....	5	4	5	1908.5	24 45'7	24 53'2	W. H. Young.
24°00 N.—N.E. cor. sec. 20.....	6	4	5	1909.7	24 36'5	24 33'5	"
60°00 N.—" 20.....	6	4	5	1909.7	24 13'8	24 15'8	"
70°00 E.—" 32.....	6	4	5	1910.7	24 48'6	24 51'6	J. L. Lang.
60°00 W.—" 36.....	6	4	5	1910.7	24 51'4	24 55'4	"
40°00 W.—" 35.....	6	4	5	1910.7	24 50'2	24 52'2	"
At N.E. cor. sec. 34.....	6	4	5	1910.7	24 50'0	24 50'0	"
40°00 W.—N.E. cor. sec. 33.....	6	4	5	1910.7	24 48'5	24 48'5	"
60°00 W.—" 34.....	6	4	5	1910.7	24 49'0	24 47'0	"
20°00 S.—" 27.....	6	4	5	1910.7	24 50'8	24 52'8	"
10°00 N.—" 26.....	6	4	5	1910.7	24 52'1	24 53'1	"
50°00 S.—" 26.....	6	4	5	1910.7	24 51'5	24 53'5	"
5°00 N.—" 11.....	6	4	5	1910.8	25 04'9	25 09'0	"
40°00 N.—S.E. cor. sec. 3.....	6	4	5	1910.8	24 59'0	24 59'7	"
At N.E. cor. sec. 4.....	6	4	9	1910.8	25 02'6	25 02'3	"
25°00 S.—N.E. cor. sec. 19.....	7	4	5	1910.6	24 41'1	24 43'2	"
10°00 S.—" 18.....	7	4	5	1910.6	24 42'6	24 44'7	"
20°00 N.—" 7.....	7	4	5	1910.6	24 41'1	24 49'2	"
12°00 E.—" 7.....	7	4	5	1910.6	24 43'1	24 46'2	"
40°00 E.—" 7.....	7	4	5	1910.6	24 44'3	24 47'4	"
5°00 S.—" 8.....	7	4	5	1910.6	24 43'3	24 47'4	"
60°00 S.—N.E. cor. sec. 6.....	7	4	5	1910.7	24 45'7	24 45'7	J. L. Lang.
19°00 W.—" 31.....	8	4	5	1909.8	24 00'0	24 00'0	"
55°00 W.—" 31.....	8	4	5	1909.8	23 59'9	24 04'6	"
40°00 W.—" 31.....	8	4	5	1909.8	24 01'7	24 01'7	"
50°00 W.—" 33.....	8	4	5	1909.7	24 00'1	24 00'1	"



TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0.	
35.00 W.—N.E. cor. sec. 33.....	8	4	5	1909.7	24 09.9		J. L. Lang.
50.00 W.—" 34.....	8	4	5	1909.7	24 04.6	24 05.6	"
At N.E. cor. sec. 34.....	8	4	5	1909.7	24 01.5		"
50.00 N.—N.E. cor. sec. 20.....	8	4	5	1909.7	24 02.1	24 11.1	"
30.00 W.—" 32.....	8	4	5	1909.7	24 00.1		"
70.00 N.—" 20.....	8	4	5	1909.8	24 02.0		"
70.00 N.—" 20.....	8	4	5	1909.8	24 01.8		"
At N.E. cor. sec. 36.....	8	4	5	1909.6	24 06.6	24 04.5	W. A. Scott.
72.00 N.—N.E. cor. sec. 29.....	8	4	5	1909.8	24 00.9	24 05.6	"
48.00 N.—" 29.....	8	4	5	1909.8	24 03.5	24 01.2	"
10.00 N.—" 29.....	8	4	5	1909.8	24 00.5	24 07.2	"
10.00 N.—" 29.....	8	4	5	1909.8	24 02.8	23 57.5	"
64.00 W.—" 31.....	8	4	5	1909.8	23 59.3	24 08.0	"
64.00 W.—" 31.....	8	4	5	1909.8	24 01.5	23 58.2	"
35.00 W.—" 34.....	8	4	5	1909.7	24 02.3	24 10.3	"
18.00 W.—" 34.....	8	4	5	1909.7	24 04.3	24 04.3	"
30.00 W.—" 33.....	8	4	5	1909.7	24 05.0	24 11.0	"
20.00 W.—" 33.....	8	4	5	1909.7	24 04.0	24 04.0	"
40.00 N.—" 7.....	9	4	5	1909.8	24 02.2	24 12.9	"
20.00 N.—" 7.....	9	4	5	1909.8	24 01.5	23 59.2	"
52.00 N.—" 6.....	9	4	5	1909.8	24 03.2	24 10.9	"
16.00 N.—N.E. cor. sec. 6.....	9	4	5	1909.8	24 01.6	23 58.3	"
29.00 N.—" 18.....	9	4	5	1909.8	24 01.3	24 08.0	"
At " 18.....	9	4	5	1909.8	24 01.6	24 01.3	"
53.00 N.—" 18.....	9	4	5	1909.8	24 01.6	24 04.3	"
53.00 N.—" 18.....	9	4	5	1909.8	24 01.0	24 02.7	"
41.00 S.—" 1.....	9	4	5	1909.6	24 00.6	24 11.5	"
At " 33.....	9	4	5	1909.9	24 05.6	24 06.6	"
70.00 S.—" 6.....	9	4	5	1909.8	24 02.5	23 59.2	"
51.00 S.—" 6.....	9	4	5	1909.8	24 00.5	24 07.2	"
11.00 S.—" 6.....	9	4	5	1909.8	24 03.1	23 56.8	"
30.00 S.—" 6.....	9	4	5	1909.8	24 03.5	24 08.2	"
35.00 E.—" 23.....	9	4	5	1909.6	24 04.0	24 02.1	"
30.00 N.—" 25.....	9	4	5	1909.6	24 02.6	23 59.7	"
55.00 N.—" 25.....	9	4	5	1909.6	24 00.3	24 02.4	"
At " 36.....	9	4	5	1909.6	24 04.7	24 02.8	"
40.00 W.—" 36.....	9	4	5	1909.6	23 57.9	24 07.0	"
30.00 N.—" 25.....	9	4	5	1909.6	23 59.1	24 10.2	"
At " 25.....	9	4	5	1909.6	24 01.6	23 59.7	"
20.00 N.—" 26.....	9	4	5	1909.6	24 03.2		"
At " 26.....	9	4	5	1909.6	24 01.1	24 09.2	"
16.00 N.—" 6.....	9	4	5	1909.8	24 02.5	24 09.2	"
65.00 W.—" 36.....	9	4	5	1909.6	23 56.0	23 55.1	"
20.00 W.—" 35.....	9	4	5	1909.6	23 56.2	24 08.3	"
40.00 W.—" 33.....	9	4	5	1909.9	24 03.8	24 00.8	"
30.00 W.—" 33.....	9	4	5	1909.9	24 03.6	24 09.6	"
11.00 W.—" 33.....	9	4	5	1909.9	24 05.4	24 03.4	"
60.00 W.—N.E. cor. sec. 33.....	9	4	5	1909.9	24 05.1	24 10.1	"
25.00 W.—" 35.....	9	4	5	1909.8	24 06.0	24 14.8	"
30.00 N.—" 20.....	9	4	5	1909.8	24 03.2	24 09.9	"
30.00 N.—" 20.....	9	4	5	1909.8	24 02.5	23 57.2	"
10.00 W.—" 34.....	9	4	5	1909.8	24 05.8		"
12.00 N.—" 20.....	9	4	5	1909.8	24 01.0	23 55.7	"
18.00 N.—" 17.....	9	4	5	1909.8	24 03.8		"
30.00 N.—" 20.....	9	4	5	1909.8	24 01.3	24 09.0	"
18.00 N.—" 17.....	9	4	5	1909.8	24 02.6		"
8.00 N.—" 19.....	9	4	5	1909.8	24 02.7	24 01.4	"
8.00 N.—" 17.....	9	4	5	1909.8	24 02.8	24 06.5	"
43.00 N.—" 19.....	9	4	5	1909.8	24 03.4	24 10.1	"
9.00 E.—" 19.....	9	4	5	1909.8	24 00.1	24 05.8	"
At " 12.....	9	4	5	1909.6	24 10.5	24 03.6	"
50.00 W.—" 12.....	9	4	5	1909.6	23 53.7	24 00.8	"
40.00 N.—" 13.....	9	4	5	1909.6	24 00.9	24 10.0	"
70.00 N.—" 13.....	9	4	5	1909.6	23 59.9	23 53.0	"
20.00 N.—" 13.....	9	4	5	1909.6	24 06.4	24 00.5	"
60.00 N.—" 12.....	9	4	5	1909.6	24 01.5	24 05.6	"
At " 23.....	9	4	5	1909.6	24 02.4	24 06.5	"



SESSIONAL PAPER No. 25b

TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
60.00 N.—N.E. cor. sec. 14.....	9	4	5	1909.6	24 04.6	23 56.7	W. A. Scott.
At " " 11.....	9	4	5	1909.6	24 07.6	23 57.7	"
40.00 N.—" " 11.....	9	4	5	1909.6	23 59.2	21 07.3	"
40.00 N.—" " 23.....	9	4	5	1909.6	24 03.2	23 54.3	"
At " " 23.....	9	4	5	1909.6	24 04.3	23 57.4	"
55.00 E.—" " 23.....	9	4	5	1909.6	23 59.0	24 05.1	"
At N.E. cor., sec. 1.....	9	4	5	1909.6	24 07.2	.....	"
50.00 N.—N.E. cor., sec. 12.....	9	4	5	1909.6	24 04.3	.....	"
30.00 N.—" " 1.....	9	4	5	1909.6	23 59.6	.....	"
12.00 N.—" " 32.....	9	4	5	1911.5	24 02.4	24 06.6	"
At " " 32.....	9	4	5	1911.5	23 59.5	24 04.7	"
20.00 N.—" " 31.....	9	4	5	1911.5	23 55.0	24 01.2	"
44.00 N.—" " 31.....	9	4	5	1911.5	23 56.1	24 00.3	"
58.00 N.—" " 31.....	9	4	5	1911.5	24 01.1	24 04.3	"
60.00 N.—" " 1.....	10	4	5	1909.6	24 05.4	24 01.5	"
30.00 N.—" " 12.....	10	4	5	1909.6	23 54.8	24 05.9	"
56.00 S.—" " 4.....	10	4	5	1909.9	24 04.6	24 10.6	"
At " " 12.....	10	4	5	1909.6	24 04.8	24 01.9	"
40.00 N.—" " 12.....	10	4	5	1909.6	24 08.1	.....	"
20.00 N.—" " 24.....	10	4	5	1909.7	24 01.4	24 01.2	"
At " " 9.....	10	4	5	1909.9	24 04.0	24 04.0	"
45.00 N.—" " 4.....	10	4	5	1909.9	24 04.3	24 09.3	"
At " " 9.....	10	4	5	1909.9	24 04.1	24 11.1	"
24.00 N.—" " 4.....	10	4	5	1909.9	24 02.6	24 00.6	"
25.00 N.—" " 25.....	10	4	5	1909.7	23 53.7	24 04.5	"
60.00 N.—" " 24.....	10	4	5	1909.7	23 52.3	24 02.1	"
At " " 25.....	10	4	5	1909.7	24 08.7	24 07.5	"
2.00 S.—" " 3.....	10	4	5	1909.9	24 06.5	24 14.5	"
2.00 S.—" " 3.....	10	4	5	1909.9	24 07.1	24 06.1	"
64.00 S.—" " 3.....	10	4	5	1909.9	24 07.0	24 09.0	"
31.00 S.—" " 4.....	10	4	5	1909.9	24 05.2	24 05.2	"
36.00 N.—" " 6.....	10	4	5	1911.5	24 02.1	24 05.3	"
70.00 N.—" " 6.....	10	4	5	1911.5	23 58.1	24 02.3	"
At N.E. cor., sec. 24.....	10	4	5	1911.6	23 57.1	23 58.6	"
67.00 N.—N.E. cor. sec. 30.....	10	4	5	1911.6	24 03.4	24 01.9	"
25.00 W.—" " 33.....	11	4	5	1910.7	23 46.2	23 50.2	"
40.50 W.—" " 33.....	11	4	5	1910.7	23 44.6	23 47.2	"
41.00 S.—" " 33.....	11	4	5	1910.7	23 50.8	23 50.8	"
0.82 N.—" " 21.....	11	4	5	1910.7	23 42.3	23 42.3	"
38.25 S.—" " 22.....	11	4	5	1910.7	23 47.6	23 47.1	"
29.00 S.—" " 10.....	11	4	5	1910.7	24 04.7	24 02.1	"
4.00 N.—" " 9.....	11	4	5	1910.8	24 00.8	.....	"
20.00 S.—" " 4.....	11	4	5	1910.8	23 52.2	23 57.3	"
64.35 S.—" " 5.....	12	4	5	1910.7	23 39.6	23 39.6	"
8.65 S.—" " 5.....	12	4	5	1910.7	23 49.7	23 51.7	"
20.00 S.—" " 9.....	12	4	5	1910.8	23 51.1	23 50.8	"
70.00 N.—" " 21.....	12	4	5	1911.7	23 49.7	23 49.7	"
62.00 N.—" " 28.....	12	4	5	1911.7	23 46.9	23 46.9	"
37.00 N.—" " 17.....	12	4	5	1911.7	23 39.1	23 41.3	"
69.00 N.—" " 7.....	12	4	5	1911.7	23 39.1	23 38.3	"
At " " 19.....	12	4	5	1911.7	23 35.6	23 35.6	"
48.00 E.—" " 19.....	12	4	5	1911.7	23 46.2	23 45.2	"
6.00 W.—" " 20.....	12	4	5	1911.7	23 46.7	23 44.7	"
50.00 E.—" " 20.....	12	4	5	1911.7	23 46.5	23 45.5	"
23.00 N.—" " 9.....	12	4	5	1911.7	23 48.1	23 48.1	"
67.00 W.—" " 19.....	12	4	5	1911.7	23 37.2	23 36.2	"
1.00 S.—" " 13.....	12	4	5	1911.7	23 49.6	23 49.6	"
9.00 N.—" " 20.....	12	4	5	1911.7	23 47.1	23 46.1	"
42.00 N.—" " 29.....	12	4	5	1911.7	23 53.5	23 53.5	"
At N.E. cor., sec. 7.....	13	4	5	1911.8	23 51.9	23 49.9	"
2nd trial line, 30.00 E.—N.E., cor. 31.	17	4	5	1911.6	25 15.7	25 16.6	E. S. Martindale.
5.00 S.—N.E. cor., sec. 2.....	20	4	5	1909.5	24 40.5	24 46.9	Jas. Warren.
50.00 S.—" " 15.....	20	4	5	1909.5	25 18.5	25 14.9	"
45.00 W.—" " 12.....	20	4	5	1909.5	24 43.5	24 51.9	"
10.00 N.—S.E. " " 11.....	20	4	5	1909.5	24 53.2	25 00.6	"
65.00 W.—N.E. " " 12.....	20	4	5	1909.5	24 43.4	24 51.8	"



TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
					° /	° /	
45.28 S.—N.E. cor. sec. 7.....	46	4	5	1909.4	26 47.9	26 56.8	L. E. Fontaine.
15.00 W.—" " 31.....	80	4	5	1910.6	29 55.3	30 02.4	A. H. Hawkins.
58.15 E.—" " 32.....	80	4	5	1910.6	30 17.9	30 21.0	"
10.00 W.—" " 35.....	84	4	5	1911.4	30 50.2	30 53.0	"
18.00 W.—" " 32.....	84	4	5	1911.4	31 27.5		"
4.39 W.—" " 31.....	84	4	5	1911.4	31 31.2	31 32.0	"
48.50 W.—" " 32.....	84	4	5	1911.4	31 28.6	31 29.4	"
5.00 N.—" " 12.....	6	5	5	1909.7	23 41.3	23 49.3	W. H. Young.
44.00 N.—" " 1.....	6	5	5	1909.7	24 28.3		"
5.00 N.—" " 12.....	6	5	5	1909.7	23 43.0	23 41.5	"
20.00 N.—" " 26.....	7	5	5	1910.6	24 42.5	24 47.6	J. L. Lang.
30.00 S.—" " 26.....	7	5	5	1910.6	24 43.9	24 47.0	"
40.00 N.—" " 16.....	8	5	5	1910.6	24 45.5	24 52.6	"
78.00 N.—" " 16.....	8	5	5	1910.6	24 32.1	24 39.2	"
60.00 N.—" " 8.....	8	5	5	1910.6	24 43.4	24 49.5	"
40.00 N.—" " 17.....	8	5	5	1910.6	24 41.1	24 48.2	"
5.00 E.—" " 20.....	8	5	5	1910.6	24 51.2	24 57.3	"
40.00 E.—" " 20.....	8	5	5	1910.6	24 45.8	24 46.9	"
At " " 21.....	8	5	5	1910.6	24 40.7	24 46.8	"
20.00 S.—N.E. cor. sec. 2.....	8	5	5	1910.6	24 45.1	24 47.2	J. L. Lang.
34.00 W.—" " 7.....	8	5	5	1911.5	24 32.5	24 36.7	P. B. Street.
9.00 N.—" " 36.....	9	5	5	1911.6	24 09.2	24 07.1	W. A. Scott.
57.00 N.—" " 1.....	10	5	5	1911.6	23 58.8	24 01.7	"
43.00 N.—" " 1.....	10	5	5	1911.6	23 56.6	24 04.5	"
45.00 E.—" " 12.....	10	5	5	1911.6	24 01.3	24 03.2	"
75.00 E.—" " 12.....	10	5	5	1911.6	24 00.4	24 03.3	"
61.00 E.—" " 12.....	10	5	5	1911.6	24 07.2	24 05.7	"
46.30 N.—" " 12.....	10	5	5	1911.6	24 13.9	24 16.4	"
16.00 N.—" " 24.....	10	5	5	1911.6	23 58.6	23 57.1	"
At " " 25.....	10	5	5	1911.6	23 53.5	23 58.0	"
17.50 S.—" " 36.....	11	5	5	1911.8	23 55.7	23 54.7	"
60.00 S.—" " 25.....	11	5	5	1911.8	23 52.7	23 53.7	"
16.00 S.—" " 29.....	11	5	5	1911.8	23 49.2	23 46.2	"
13.00 S.—" " 13.....	11	5	5	1911.8	23 55.2	23 51.2	"
68.00 S.—" " 13.....	11	5	5	1911.8	23 54.4	23 51.4	"
37.00 S.—" " 12.....	11	5	5	1911.8	23 51.1	23 48.1	"
40.00 S.—" " 1.....	11	5	5	1911.8	23 52.5	23 48.3	"
40.00 S.—" " 1.....	11	5	5	1911.8	23 56.3	23 52.1	"
20.00 S.—" " 36.....	12	5	5	1911.7	23 49.3	23 49.3	"
1.00 S.—" " 25.....	12	5	5	1911.7	23 47.9	23 44.9	"
10.00 S.—" " 24.....	12	5	5	1911.7	23 49.8	23 46.8	"
43.00 N.—" " 36.....	12	5	5	1911.8	23 47.6	23 44.6	"
73.00 S.—" " 12.....	12	5	5	1911.8	23 49.0	23 46.0	"
47.00 S.—" " 13.....	12	5	5	1911.8	23 51.5	23 48.5	"
14.00 N.—" " 1.....	13	5	5	1911.8	23 49.0	23 46.0	"
At " " 12.....	13	5	5	1911.8	23 52.7	23 48.7	"
61.85 S.—" " 27.....	17	5	5	1911.6	25 03.6	25 07.1	E. S. Martindale.
50.00 W.—" " 33.....	17	5	5	1911.6	25 03.2	25 05.7	"
10.00 E.—" " 31.....	20	5	5	1909.7	25 09.8	25 17.8	Jas. Warren.
60.00 W.—" " 31.....	20	5	5	1909.7	25 06.0	25 13.0	"
51.00 W.—" " 31.....	20	5	5	1909.7	24 56.9		"
61.56 N.—" " 16.....	45	5	5	1909.4	26 48.4	26 58.8	L. E. Fontaine.
65.07 S.—" " 31.....	46	5	5	1909.4	26 24.2	26 24.9	"
22.03 S.—" " 11.....	47	5	5	1910.5	26 35.7	26 44.1	"
At " " 33.....	80	5	5	1910.6	29 43.9	29 50.0	A. H. Hawkins.
29.24 E.—" " 34.....	80	5	5	1910.6	29 44.7	29 50.8	"
79.10 E.—" " 34.....	80	5	5	1910.6	29 04.1	30 09.2	"
60.09 E.—" " 32.....	80	5	5	1910.6	29 44.0		"
32.03 W.—" " 36.....	84	5	5	1911.4	31 20.3	31 19.1	"
64.10 W.—" " 35.....	84	5	5	1911.4	31 15.4	31 13.2	"
61.50 W.—" " 34.....	84	5	5	1911.4	31 29.5	31 30.3	"
9.00 W.—" " 33.....	84	5	5	1911.4	31 16.9	31 16.7	"
38.18 W.—" " 36.....	17	6	5	1911.6	25 04.8	25 04.3	E. S. Martindale.
48.80 W.—" " 33.....	17	6	5	1911.7	25 11.8	25 12.0	"
65.57 W.—" " 31.....	17	6	5	1911.7	25 16.3	25 15.3	"
33.95 S.—" " 27.....	17	6	5	1911.8	25 00.0	24 58.0	"



SESSIONAL PAPER No. 25b

TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
62.39 N.—N.E. cor. sec. 11.....	17	6	5	1911.8	25 11.4	25 07.4	E. S. Martindale.
58.77 E.—" 22.....	17	6	5	1911.8	25 00.1	24 56.9	"
36.83 S.—" 18.....	18	6	5	1911.8	25 19.2	25 16.2	"
34.23 E.—" 7.....	18	6	5	1911.8	25 15.1	25 12.1	"
4.00 E.—" 34.....	20	6	5	1909.8	25 06.0	25 12.7	Jas. Warren.
20.00 W.—" 35.....	20	6	5	1909.8	25 12.2	25 10.9	"
4.00 E.—" 34.....	20	6	5	1909.8	25 10.0	25 15.7	"
10.00 E.—" 35.....	20	6	5	1909.7	24 58.4	25 03.4	"
16.00 W.—" 35.....	20	6	5	1909.8	25 03.9	.....	"
32.00 W.—" 33.....	20	6	5	1909.8	25 08.2	25 15.9	"
68.00 W.—" 32.....	20	6	5	1909.8	25 06.6	25 08.3	"
30.00 W.—" 32.....	20	6	5	1909.8	25 07.0	25 09.7	"
8.00 W.—" 31.....	20	6	5	1909.8	25 11.3	25 14.0	"
At " 13.....	21	6	5	1911.5	25 15.6	25 14.7	C. M. Walker.
50.00 E.—" 32.....	21	6	5	1911.5	25 33.0	25 33.2	"
At " 6.....	22	6	5	1911.5	25 29.8	25 32.0	"
At " 4.....	22	6	5	1911.6	25 34.9	25 32.8	"
10.00 S.—" 1.....	22	6	5	1911.7	25 28.3	25 25.5	"
41.00 N.—" 8.....	22	6	5	1911.6	25 32.5	25 32.4	"
10.00 S.—" 18.....	22	6	5	1911.6	25 29.8	25 29.3	"
40.09 N.—" 15.....	22	6	5	1911.7	25 23.7	25 16.7	"
62.00 N.—" 24.....	22	6	5	1911.7	25 19.5	25 15.5	"
At " 28.....	22	6	5	1911.7	25 17.2	25 13.2	"
24.00 N.—" 24.....	22	6	5	1911.8	25 12.2	25 09.2	"
10.00 W.—" 36.....	22	6	5	1911.9	25 37.4	25 34.9	"
62.50 W.—" 33.....	22	6	5	1911.9	25 33.6	25 29.1	"
48.75 W.—" 33.....	23	6	5	1911.0	24 58.3	24 57.2	J. R. Akins.
62.50 W.—" 34.....	23	6	5	1910.9	24 57.9	24 58.2	"
40.00 N.—" 8.....	23	6	5	1911.8	25 20.8	25 19.8	C. M. Walker.
At " 5.....	23	6	5	1911.8	25 35.6	25 30.4	"
40.00 N.—" 4.....	23	6	5	1911.8	25 38.2	25 33.0	"
24.06 S.—N.E. cor. sec. 30.....	24	6	5	1910.9	24 53.7	24 49.1	J. R. Akins.
47.00 E.—" 20.....	24	6	5	1910.9	24 55.2	.....	"
5.90 W.—" 7.....	24	6	5	1910.9	24 59.2	24 59.6	"
26.50 S.—" 7.....	24	6	5	1910.9	24 57.9	24 57.3	"
50.00 S.—" 21.....	24	6	5	1910.9	24 53.6	25 00.0	"
25.00 E.—" 9.....	24	6	5	1910.9	24 55.5	24 54.9	"
60.00 S.—" 6.....	24	6	5	1910.9	24 42.4	24 42.8	"
56.00 S.—" 4.....	24	6	5	1910.9	24 52.8	25 00.2	"
71.25 S.—" 22.....	24	6	5	1910.9	24 53.0	24 53.4	"
7.00 S.—" 3.....	24	6	5	1910.9	24 52.9	24 52.1	"
24.25 S.—" 14.....	24	6	5	1910.9	24 52.0	24 51.2	"
62.25 S.—" 11.....	24	6	5	1910.9	24 54.7	24 55.9	"
23.09 S.—" 2.....	24	6	5	1910.9	24 51.2	24 51.4	"
30.46 S.—" 35.....	45	6	5	1909.4	26 57.0	27 05.9	L. E. Fontaine.
5.11 S.—" 20.....	48	6	5	1910.5	26 13.6	26 23.4	"
6.42 S.— $\frac{1}{4}$ post E. By. sec. 28.....	48	6	5	1911.6	26 23.9	26 23.4	"
62.54 W.—N.E. cor. sec. 31.....	80	6	5	1910.5	30 08.8	30 13.2	A. H. Hawkins.
34.10 E.—" 34.....	80	6	5	1910.6	30 03.9	30 09.0	"
28.00 W.—" 35.....	84	6	5	1911.4	30 35.0	30 39.8	"
30.50 W.—" 33.....	84	6	5	1911.4	30 00.6	30 03.0	"
57.00 W.—" 31.....	84	6	5	1911.4	30 35.4	30 35.8	"
52.49 W.—" 34.....	108	6	5	1910.2	32 37.2	32 41.3	A. W. Ponton.
52.49 W.—" 34.....	108	6	5	1910.2	32 30.2	32 38.3	"
52.49 W.—" 34.....	108	6	5	1910.2	32 29.3	32 38.4	"
52.49 W.—" 34.....	108	6	5	1910.2	32 28.5	32 34.6	"
52.49 W.—" 34.....	108	6	5	1910.2	32 34.5	32 34.6	"
52.49 W.—" 34.....	108	6	5	1910.2	32 38.3	32 35.4	"
52.49 W.—" 34.....	108	6	5	1910.2	32 39.4	32 39.5	"
52.49 W.—" 34.....	108	6	5	1910.2	32 35.4	32 41.5	"
52.49 W.—" 34.....	108	6	5	1910.2	32 29.4	32 39.5	"
52.49 W.—" 34.....	108	6	5	1910.2	32 26.8	32 32.9	"
52.49 W.—" 34.....	108	6	5	1910.2	32 40.7	32 38.8	"
52.49 W.—" 34.....	108	6	5	1910.2	32 39.6	32 38.7	"
52.49 W.—" 34.....	108	6	5	1910.2	32 25.7	32 29.8	"
30.63 N.—N.E. cor. sec. 12.....	18	7	5	1911.7	25 13.9	25 13.9	E. S. Martindale.
68.87 N.—" 23.....	18	7	5	1911.7	25 30.4	25 29.4	"



3 GEORGE V., A. 1913

TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
29.32 E.—N.E. cor. sec. 24.....	13	7	5	1911.7	25 23.7	25 23.7	E. S. Martindale.
28.91 W.—" " 36.....	18	7	5	1911.8	25 31.9	25 30.9	" "
10.00 W.—" " 19.....	19	7	5	1911.7	25 26.5	25 26.5	A. L. Cumming.
8.00 S.—" " 15.....	19	7	5	1911.7	25 30.1	25 26.4	" "
5.00 W.—S.E. cor. sec. 1.....	19	7	5	1911.8	25 30.4	25 26.4	" "
5.00 W.—" " 2.....	19	7	5	1911.8	25 27.8	25 23.8	" "
20.00 N.—N.E. cor. sec. 29.....	19	7	5	1911.8	25 29.9	25 28.9	" "
10.00 S.—" " 31.....	19	7	5	1911.9	25 28.8	25 24.3	" "
At N.E. cor. sec. 36.....	20	7	5	1910.4	23 47.2	23 57.1	J. R. Akins.
9.90 W.—N.E. cor. sec. 31.....	20	7	5	1910.4	24 23.6	24 25.7	" "
8.00 N.—" " 24.....	21	7	5	1911.4	25 32.5	25 33.9	C. M. Walker.
At N.E. cor. sec. 12.....	22	7	5	1911.6	25 27.1	" "	" "
41.00 N.—N.E. cor. sec. 12.....	22	7	5	1911.6	25 29.7	25 27.2	" "
20.00 S.—" " 24.....	23	7	5	1911.8	25 17.4	25 15.4	" "
60.00 E.—" " 22.....	31	7	5	1910.9	25 39.2	25 43.6	G. J. Lonergan.
19.76 S.—" " 34.....	47	7	5	1910.5	26 15.1	" "	L. E. Fontaine.
12.31 N.—" " 21.....	49	7	5	1909.4	26 36.9	26 38.6	" "
29.01 S.—" " 2.....	51	7	5	1909.5	27 23.5	27 32.1	" "
61.85 S.—" " 6.....	52	7	5	1909.5	27 49.2	27 56.8	" "
74.50 W.—" " 33.....	55	7	5	1910.2	28 10.4	28 15.5	" "
46.00 W.—" " 32.....	61	7	5	1908.9	27 28.0	" "	G. J. Lonergan.
39.80 W.—" " 31.....	89	7	5	1910.5	29 02.7	29 08.1	A. H. Hawkins.
66.95 E.—" " 32.....	80	7	5	1910.5	29 00.3	29 01.7	" "
9.16 E.—" " 34.....	80	7	5	1910.5	29 20.7	29 26.1	" "
42.60 W.—" " 31.....	84	7	5	1911.4	31 08.2	" "	" "
26.00 W.—" " 36.....	84	7	5	1911.4	30 56.9	30 57.3	" "
59.00 W.—" " 34.....	84	7	5	1911.4	31 13.7	31 18.1	" "
39.60 W.—" " 32.....	84	7	5	1911.4	31 06.3	" "	" "
10.00 S.—" " 23.....	20	8	5	1911.8	25 38.2	25 33.0	A. L. Cumming.
20.00 S.—" " 14.....	20	8	5	1911.8	25 35.2	25 30.0	" "
29.19 W.—" " 35.....	20	8	5	1910.5	25 30.7	25 28.5	J. R. Akins.
72.64 W.—" " 32.....	32	8	5	1909.8	26 30.9	26 32.6	B. J. Saunders.
72.64 W.—" " 32.....	32	8	5	1909.8	26 31.9	26 33.6	" "
63.84 W.—" " 35.....	32	8	5	1909.8	26 16.7	" "	" "
63.84 W.—" " 35.....	32	8	5	1909.8	26 16.1	" "	" "
8.00 W.—" " 36.....	36	8	5	1909.5	26 29.1	26 31.5	" "
8.00 W.—" " 36.....	36	8	5	1909.5	26 29.6	26 31.0	" "
42.00 W.—" " 35.....	36	8	5	1909.5	26 29.0	26 31.4	" "
63.44 N.—" " 21.....	37	8	5	1910.6	26 19.8	26 22.9	L. E. Fontaine.
21.94 N.—" " 29.....	38	8	5	1910.6	26 46.2	26 45.3	" "
4.45 N.—" " 16.....	48	8	5	1911.9	27 03.9	27 00.5	" "
53.15 N.—N.E. cor. sec. 9.....	50	8	5	1911.2	27 28.3	27 32.4	" "
2.10 N.—" " 3.....	51	8	5	1911.2	27 35.7	27 36.8	" "
50.89 S.—" " 4.....	53	8	5	1909.6	27 41.4	27 47.3	" "
46.14 W.—" " 35.....	54	8	5	1910.3	28 07.0	28 14.2	" "
0.61 S.—S.E. cor. sec. 5.....	59	8	5	1910.7	28 51.0	28 51.0	" "
14.91 N.—N.E. cor. sec. 33.....	59	8	5	1910.7	29 10.7	29 14.7	" "
39.00 W.—" " 36.....	84	8	5	1911.5	31 12.3	31 12.4	A. H. Hawkins.
77.75 W.—" " 31.....	84	8	5	1911.5	29 37.4	29 35.5	" "
At N.E. cor. sec. 36.....	108	8	5	1910.3	32 53.7	33 02.4	A. W. Ponton.
" " " 36.....	108	8	5	1910.3	32 51.1	32 55.3	" "
" " " 36.....	108	8	5	1910.3	32 53.0	" "	" "
18.60 W.—N.E. cor. sec. 36.....	108	8	5	1910.3	33 07.7	33 06.9	" "
18.60 W.—" " 36.....	108	8	5	1910.3	33 07.3	33 10.5	" "
At N.E. cor. sec. 36.....	108	8	5	1910.3	33 12.7	33 10.9	" "
" " " 36.....	108	8	5	1910.3	33 02.8	33 13.0	" "
" " " 36.....	108	8	5	1910.3	32 58.1	33 03.3	" "
" " " 36.....	108	8	5	1910.3	33 05.2	33 08.4	" "
18.60 W.—N.E. cor. sec. 36.....	108	8	5	1910.3	33 07.7	33 07.9	" "
18.60 W.—" " 36.....	108	8	5	1910.3	32 53.3	33 01.5	" "
18.60 W.—" " 36.....	108	8	5	1910.3	32 53.4	32 57.6	" "
18.60 W.—" " 36.....	108	8	5	1910.3	32 58.8	33 02.0	" "
18.60 W.—" " 36.....	108	8	5	1910.3	33 09.6	33 11.8	" "
18.60 W.—" " 36.....	108	8	5	1910.3	32 59.4	33 05.6	" "
18.60 W.—" " 36.....	108	8	5	1910.3	32 46.3	32 55.5	" "
18.60 W.—" " 36.....	108	8	5	1910.3	32 48.7	32 57.9	" "
18.60 W.—" " 36.....	108	8	5	1910.3	32 51.8	32 59.0	" "



## SESSIONAL PAPER No. 25b

TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912-0	
18.60 W.—N.E. cor. sec. 36.....	108	8	5	1910.3	32 52.1	32 59.3	A. W. Ponton.
18.60 W.—" " 36.....	108	8	5	1910.3	32 55.2	32 59.4	"
18.60 W.—" " 36.....	108	8	5	1910.3	33 05.7	33 04.9	"
13.00 W.—" " 35.....	20	9	5	1910.5	25 21.6	25 30.0	J. R. Akins.
16.00 W.—" " 36.....	20	9	5	1910.5	25 32.8	25 30.2	"
54.00 N.—" " 35.....	20	9	5	1910.5	25 17.7	25 25.1	"
At N.E. cor. sec. 3.....	21	9	5	1910.6	25 25.8	25 28.9	"
32.00 N.—N.E. cor. sec. 22.....	21	9	5	1910.6	25 20.7	25 25.8	"
6.00 N.—" " 27.....	21	9	5	1910.6	25 05.4	25 08.5	"
8.60 N.—" " 34.....	21	9	5	1910.6	25 07.4	25 12.5	"
58.00 W.—" " 35.....	21	9	5	1910.6	25 13.7	25 18.8	"
6.00 N.—" " 36.....	21	9	5	1910.7	25 14.0	25 17.8	"
68.00 N.—" " 27.....	22	9	5	1910.8	25 01.7	25 08.8	"
60.25 N.—" " 12.....	22	9	5	1910.7	25 10.4	25 15.4	"
39.00 N.—" " 13.....	22	9	5	1910.7	25 13.6	25 13.6	"
80.00 N.—" " 13.....	22	9	5	1910.7	25 03.2	25 13.2	"
25.00 S.—" " 29.....	23	9	5	1909.6	24 39.3	24 39.4	Jas. Warren.
At S.E. cor. sec. 30.....	23	9	5	1909.6	24 30.6	24 26.7	"
10.00 N.—S.W. cor. sec. 29.....	23	9	5	1909.6	24 32.1	24 39.7	"
20.00 N.—S.E. cor. sec. 20.....	23	9	5	1909.6	24 41.4	24 42.3	"
At N.E. cor. sec. 9.....	23	9	5	1909.6	24 44.4	24 41.5	"
30.00 S.—N.E. cor. sec. 21.....	23	9	5	1909.6	24 32.2	24 36.3	"
At N.E. cor. sec. 9.....	23	9	5	1909.6	24 33.7	24 37.8	"
5.00 E.—N.E. cor. sec. 19.....	23	9	5	1909.6	24 40.6	24 32.7	"
20.00 S.—" " 22.....	23	9	5	1909.6	24 47.4	24 38.5	"
30.00 S.—" " 15.....	23	9	5	1909.6	24 42.8	24 49.9	"
10.00 S.—N.W. cor. sec. 30.....	23	9	5	1909.6	24 31.0	24 35.1	"
40.00 S.—S.W. cor. sec. 32.....	23	9	5	1909.6	24 33.1	24 34.2	"
30.00 S.—N.W. cor. sec. 30.....	23	9	5	1909.6	24 31.2	24 39.3	"
40.00 E.—S.W. cor. sec. 30.....	23	9	5	1909.6	24 34.2	24 38.3	"
50.00 S.—N.E. cor. sec. 16.....	23	9	5	1909.6	24 35.4	24 36.5	"
At N.E. cor. sec. 16.....	23	9	5	1909.6	24 35.5	24 42.6	"
42.00 E.—N.E. cor. sec. 10.....	23	9	5	1909.6	24 47.0	24 59.1	"
59.00 S.—" " 15.....	23	9	5	1909.6	24 47.4	24 52.5	"
20.00 W.—" " 10.....	23	9	5	1909.6	24 38.3	24 50.4	"
70.00 S.—" " 4.....	23	9	5	1909.7	24 43.2	24 53.0	"
10.00 S.—" " 8.....	23	9	5	1909.7	24 46.6	.....	"
5.00 N.—" " 4.....	23	9	5	1909.7	24 40.5	24 40.3	"
30.00 S.—" " 4.....	23	9	5	1909.7	24 55.5	25 01.3	"
27.00 S.—" " 5.....	23	9	5	1909.7	24 52.2	24 58.2	"
38.00 S.—" " 5.....	23	9	5	1909.7	24 58.0	24 58.0	"
60.00 S.—" " 10.....	23	9	5	1909.7	24 56.2	24 55.2	"
4.00 S.—" " 10.....	23	9	5	1909.7	24 53.6	24 51.6	"
10.00 S.—" " 2.....	23	9	5	1909.7	24 46.5	24 52.5	"
68.00 S.—" " 11.....	23	9	5	1909.7	24 48.4	.....	"
55.25 W.—" " 2.....	23	9	5	1910.8	25 07.8	25 08.9	J. R. Akins.
46.60 W.—S.E. cor. sec. 3.....	23	9	5	1910.8	25 16.8	25 12.9	"
8.00 S.—N.E. cor. sec. 10.....	24	9	5	1910.9	24 54.1	24 53.3	"
17.00 W.—" " 8.....	24	9	5	1910.9	24 57.3	.....	"
27.00 S.—" " 15.....	29	9	5	1909.6	24 52.9	24 50.0	Jas. Warren.
30.90 W.—" " 36.....	32	9	5	1909.8	26 37.9	26 38.6	B. J. Saunders.
30.90 W.—" " 36.....	32	9	5	1909.8	26 38.9	26 39.6	"
52.95 W.—N.E. cor. sec. 31.....	32	9	5	1909.8	26 55.7	26 58.4	B. J. Saunders.
52.95 W.—" " 31.....	32	9	5	1909.8	26 57.8	27 00.5	"
19.90 W.—" " 32.....	36	9	5	1909.6	26 40.4	26 41.5	"
19.90 W.—" " 32.....	36	9	5	1909.6	26 40.9	26 44.0	"
37.30 W.—" " 35.....	36	9	5	1909.6	26 36.8	26 35.9	"
37.30 W.—" " 35.....	36	9	5	1909.6	26 35.0	26 34.1	"
17.91 N.—" " 14.....	48	9	5	1912.0	27 23.5	27 19.8	L. E. Fontaine.
2.79 N.—" " 11.....	49	9	5	1912.0	27 37.1	27 31.4	"
14.15 N.—" " 35.....	49	9	5	1911.2	27 33.1	27 36.2	"
7.90 N.—" " 36.....	49	9	5	1911.2	27 30.1	27 33.2	"
39.68 S.—" " 31.....	52	9	5	1909.5	28 00.5	28 07.7	"
13.37 N.—" " 21.....	59	9	5	1910.7	28 07.1	28 08.1	"
At " " 33.....	80	9	5	1910.5	29 11.5	29 19.3	A. H. Hawkins.



TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
13.00 E.—N. E. cot. sec. 34. ....	80	9	5	1910.5	29 08.9	29 12.7	A. H. Hawkins.
0.85 E.—" 35. ....	80	9	5	1910.5	29 24.7	29 29.1	"
20.13 W.—" 36. ....	84	9	5	1911.5	29 38.9	29 39.0	"
73.95 W.—" 35. ....	84	9	5	1911.5	30 04.8	30 06.9	"
2.66 W.—" 32. ....	84	9	5	1911.5	29 40.6	29 40.7	"
28.00 W.—" 32. ....	108	9	5	1910.3	31 49.4	31 54.6	A. W. Ponton.
28.00 W.—" 32. ....	108	9	5	1910.3	31 43.0	31 46.2	"
28.00 W.—" 32. ....	108	9	5	1910.3	32 00.9	32 02.1	"
28.00 W.—" 32. ....	108	9	5	1910.3	31 47.7	31 54.9	"
28.00 W.—" 32. ....	108	9	5	1910.3	31 52.4	31 57.6	"
45.43 W.—" 36. ....	32	10	5	1909.8	26 37.5		B. J. Saunders.
45.43 W.—" 36. ....	32	10	5	1909.8	26 44.6		"
39.64 W.—" 32. ....	32	10	5	1909.9	26 45.1	26 45.5	"
39.64 W.—" 32. ....	32	10	5	1909.9	26 47.1	26 47.5	"
69.90 W.—" 32. ....	36	10	5	1909.6	27 45.0	27 45.1	"
42.62 W.—" 34. ....	36	10	5	1909.6	27 29.3	27 30.4	"
9.88 S.—" 28. ....	49	10	5	1911.7	27 58.0	27 53.0	L. E. Fontaine.
5.97 S.—" 9. ....	52	10	5	1910.3	27 40.8		"
56.70 E.—" 31. ....	80	10	5	1910.5	32 41.8		A. H. Hawkins.
43.11 E.—" 33. ....	80	10	5	1910.5	30 22.1	30 25.9	"
43.20 W.—" 36. ....	84	10	5	1911.5	29 30.9	29 30.1	"
8.53 W.—" 35. ....	84	10	5	1911.5	30 19.8	30 23.0	"
66.92 W.—" 31. ....	84	10	5	1911.5	30 27.6	30 33.8	"
69.02 W.—" 32. ....	36	11	5	1909.7	26 43.5	26 33.5	B. J. Saunders.
69.02 W.—" 32. ....	36	11	5	1909.7	26 45.7	26 35.7	"
58.10 W.—" 36. ....	36	11	5	1909.7	27 09.0	27 06.8	"
58.10 W.—" 36. ....	36	11	5	1909.7	27 09.2	27 08.0	"
64.07 S.—" 12. ....	48	11	5	1912.0	28 19.2	28 15.5	L. E. Fontaine.
16.38 S.—" 35. ....	49	11	5	1911.7	27 43.5	27 40.5	"
0.88 N.—" 32. ....	57	11	5	1909.9	29 23.8	29 26.8	"
5.00 E.—" 31. ....	80	11	5	1910.4	29 40.0	29 44.1	A. H. Hawkins.
76.00 E.—" 31. ....	80	11	5	1910.5	29 46.6	29 49.4	"
7.00 E.—" 33. ....	80	11	5	1910.5	30 01.2	30 05.0	"
25.00 E.—" 34. ....	80	11	5	1910.5	30 02.8	30 05.6	"
25.00 W.—" 34. ....	84	11	5	1911.5	29 44.6	29 48.8	"
11.43 W.—" 33. ....	84	11	5	1911.5	29 33.8	29 38.0	"
61.52 W.—" 33. ....	84	11	5	1911.5	29 26.0	29 28.2	"
27.24 W.—" 32. ....	108	11	5	1910.6	33 16.4	33 15.5	A. W. Ponton.
27.24 W.—" 32. ....	108	11	5	1910.6	33 13.7	33 20.8	"
27.24 W.—" 32. ....	108	11	5	1910.6	33 17.6	33 21.7	"
27.24 W.—" 32. ....	108	11	5	1910.6	33 14.3	33 16.4	"
27.24 W.—" 32. ....	108	11	5	1910.6	33 29.1	33 26.2	"
27.24 W.—" 32. ....	108	11	5	1910.6	33 27.7	33 27.8	"
27.24 W.—" 32. ....	108	11	5	1910.6	33 20.1	33 26.2	"
27.24 W.—" 32. ....	108	11	5	1910.6	33 11.8	33 14.9	"
3.30 S.—" 24. ....	51	12	5	1911.7	28 00.6	27 56.6	L. E. Fontaine.
41.97 N.—" 22. ....	52	12	5	1910.3	28 12.2		"
0.44 N.—" 24. ....	54	12	5	1910.4	28 03.4	28 06.3	"
50.46 N.—" 23. ....	56	12	5	1909.9	28 00.2	28 06.8	"
0.64 N.—" 32. ....	57	12	5	1909.9	29 10.0	29 15.0	"
68.10 W.—" 31. ....	80	12	5	1910.4	30 22.0	30 24.1	A. H. Hawkins.
4.61 E.—" 32. ....	80	12	5	1910.4	30 20.8	30 24.9	"
5.00 E.—" 34. ....	80	12	5	1910.4	29 51.3	29 53.4	"
6.00 E.—" 35. ....	80	12	5	1910.4	29 48.7	29 51.8	"
20.25 W.—" 36. ....	84	12	5	1911.5	28 57.0	29 02.2	"
64.53 W.—" 35. ....	84	12	5	1911.5	29 25.9	29 27.1	"
30.00 W.—" 31. ....	84	12	5	1911.6	29 17.9	29 16.8	"
44.73 W.—" 31. ....	84	12	5	1911.6	29 16.0	29 15.9	"
54.34 W.—" 32. ....	40	13	5	1908.7	27 35.8	27 45.3	B. J. Saunders.
8.46 N.—" 36. ....	49	13	5	1911.9	27 48.1	27 41.6	L. E. Fontaine.
2.50 N.—" 16. ....	50	13	5	1911.9	27 52.1	27 49.6	"
16.89 N.—" 9. ....	51	13	5	1911.9	28 07.9	28 03.4	"
36.25 W.—" 20. ....	56	13	5	1909.8	28 53.9	28 57.2	"
0.48 N.—" 10. ....	57	13	5	1909.8	28 44.8	28 48.1	"
10.03 N.—" 10. ....	59	13	5	1910.8	28 12.2	28 15.3	"



SESSIONAL PAPER No. 25b

TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912-0	
1.98 S.E.—N.E. cor. sec. 4.....	59	13	5	1911.4	28 19.1	28 21.5	L. E. Fontaine.
75.00 W.—N. E. cor. sec. 31.....	80	13	5	1910.4	30 01.0	30 01.0	A. H. Hawkins.
At " " 31.....	80	13	5	1910.4	30 04.0	30 08.9	"
60.00 E.—" " 31.....	80	13	5	1910.4	30 07.4	30 12.3	"
78.00 E.—" " 32.....	80	13	5	1910.4	30 19.3	30 23.4	"
At " " 34.....	80	13	5	1910.4	30 09.0	30 15.1	"
42.00 E.—" " 35.....	80	13	5	1910.4	30 09.0	30 13.1	"
21.54 W.—" " 35.....	84	13	5	1911.6	29 19.2	29 23.1	"
21.54 W.—" " 35.....	84	13	5	1911.6	29 21.1	29 25.0	"
78.64 W.—" " 31.....	84	13	5	1911.6	29 31.7	29 33.8	"
E. end Base (Castle Mt.)							
Approx. Middle N. $\frac{1}{2}$ sec. 31.....	27	14	5	1911.6	25 53.1	25 52.0	M. P. Bridgland.
24.36 W.—N. E. cor. sec. 34.....	40	14	5	1908.7	27 27.8	27 38.3	B. J. Saunders.
28.01 S.—" " 12.....	54	14	5	1911.3	27 54.2	27 56.6	L. E. Fontaine.
10.76 S.—" " 34.....	55	14	5	1909.8	28 57.1	28 59.8	"
66.33 W.—" " 31.....	55	14	5	1909.8	29 15.3	29 14.0	"
16.00 W.—" " 31.....	80	14	5	1910.4	29 37.8	29 41.7	A. H. Hawkins.
23.00 E.—" " 31.....	80	14	5	1910.4	29 36.0	29 36.0	"
20.00 E.—" " 32.....	80	14	5	1910.4	29 43.2	29 43.2	"
45.00 E.—" " 33.....	80	14	5	1910.4	29 48.8	29 53.7	"
5.00 E.—" " 35.....	80	14	5	1910.4	30 03.4	30 10.3	"
10.48 W.—" " 32.....	84	14	5	1911.6	30 22.7	30 20.2	"
39.05 W.—" " 36.....	84	14	5	1911.6	30 54.6	30 55.1	"
27.10 W.—" " 31.....	84	14	5	1911.6	30 34.4	30 36.9	"
32.00 W.—" " 32.....	40	15	5	1908.8	27 14.6	27 23.4	B. J. Saunders.
32.00 W.—" " 32.....	40	15	5	1908.8	27 14.4	27 21.2	"
32.75 N.—" " 15.....	56	15	5	1911.4	29 23.0	29 23.0	L. E. Fontaine.
At " " 33.....	80	15	5	1910.4	29 24.8	29 26.7	A. H. Hawkins.
50.00 E.—" " 34.....	80	15	5	1910.4	29 27.6	29 33.5	"
60.00 E.—" " 35.....	80	15	5	1910.4	29 29.9	29 33.8	"
4.00 W.—" " 36.....	84	15	5	1911.6	30 38.1	30 38.6	"
52.50 W.—" " 34.....	84	15	5	1911.6	30 36.4	30 33.9	"
1.00 W.—" " 31.....	84	15	5	1911.6	30 29.2	30 30.7	"
52.50 W.—" " 34.....	84	15	5	1911.6	30 40.6	30 41.1	"
2.00 W.—" " 34.....	39	16	5	1910.4	26 43.0	26 47.1	J. B. McFarlane.
19.60 W.—" " 32.....	39	16	5	1910.4	26 38.1	26 40.2	"
69.80 S.—" " 28.....	39	16	5	1910.5	26 40.1	26 43.9	"
10.00 W.—" " 7.....	39	16	5	1910.5	26 26.3	26 34.1	"
78.00 W.—" " 19.....	39	16	5	1910.5	26 31.1	26 35.9	"
69.02 S.—" " 25.....	40	16	5	1910.4	26 43.0	26 47.9	"
0.25 S.—" " 3.....	56	16	5	1911.4	28 21.8	28 22.2	L. E. Fontaine.
10.62 N.—" " 1.....	57	16	5	1911.8	28 46.9	28 40.9	"
At " " 19.....	57	16	5	1911.8	28 26.0	28 21.0	"
66.24 W.—" " 31.....	80	16	5	1910.3	29 27.6	29 33.8	A. H. Hawkins.
21.62 E.—" " 32.....	80	16	5	1910.4	29 24.7	29 30.6	"
22.09 E.—" " 35.....	80	16	5	1910.4	29 29.1	29 34.0	"
30.00 W.—" " 34.....	84	16	5	1911.6	30 21.9	30 18.4	"
50.57 W.—" " 31.....	84	16	5	1911.7	30 22.8	30 20.0	"
43.00 W.—" " 36.....	84	16	5	1911.6	30 16.5	30 16.0	"
18.85 W.—" " 33.....	84	16	5	1911.6	30 13.7	30 13.7	"
18.00 N.—" " 12.....	39	17	5	1910.5	26 40.7	26 45.1	J. B. McFarlane.
21.00 W.—" " 23.....	39	17	5	1910.5	26 41.1	26 46.5	"
At " " 22.....	39	17	5	1910.5	26 41.3	26 48.7	"
60.00 W.—" " 32.....	39	17	5	1910.5	26 39.6	26 47.0	"
11.50 S.—" " 26.....	39	17	5	1910.5	26 37.2	26 44.6	"
56.22 S.—" " 23.....	39	17	5	1910.5	26 41.0	26 45.4	"
45.00 W.—" " 22.....	39	17	5	1910.6	26 40.1	26 45.2	"
73.00 S.—" " 28.....	39	17	5	1910.6	26 27.8	26 32.9	"
3.00 W.—" " 36.....	39	17	5	1909.7	26 39.9	26 42.4	A. McFee.
At N. E. cor. sec. 36.....	40	17	5	1909.7	26 25.6	26 31.6	"
0.08 N.—N. E. cor. sec. 10.....	54	17	5	1910.8	29 12.3	29 14.4	L. E. Fontaine.
32.91 N.—N. E. cor. sec. 2.....	56	17	5	1911.4	27 39.6	27 42.4	"
25.00 N.—S. E. " 9.....	79	17	5	1911.8	29 29.3	29 26.3	G. J. Lonergan.
At S. E. " " 8.....	79	17	5	1911.8	29 29.7	29 23.7	"
43.07 E.—N.E. cor. sec. 31.....	80	17	5	1910.3	29 27.5	29 32.7	A. H. Hawkins.



TABLE No. 4—Continued..

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0.	
5.57 E.—N.E. cor. sec. 34.....	80	17	5	1910.3	29 32.5	29 33.7	A. H. Hawkins.
10.00 W.—" " 33.....	84	17	5	1911.7	29 54.7	29 52.9	"
38.00 W.—" " 35.....	84	17	5	1911.7	30 06.4	30 02.4	"
At " " 31.....	23	18	5	1911.7	26 04.3	26 01.5	C. H. Taggart.
2.00 N.—" " 22.....	23	18	5	1911.7	25 52.5	25 49.5	"
5.00 S.—" " 24.....	39	18	5	1909.7	26 42.1	"	A. McFee.
26.54 S.—" " 31.....	51	18	5	1911.3	27 53.4	"	L. E. Fontaine.
17.01 N.—" " 13.....	54	18	5	1910.8	28 40.8	28 39.5	"
1.10 S.—" " 21.....	55	18	5	1911.4	27 58.8	27 58.6	"
32.30 S.—" " 7.....	56	18	5	1911.8	28 23.7	28 19.7	"
41.45 E.—" " 31.....	80	18	5	1910.3	29 28.8	29 37.0	A. H. Hawkins.
65.34 E.—" " 34.....	80	18	5	1910.3	29 28.9	29 34.1	"
80.50 W.—" " 36.....	84	18	5	1911.7	30 18.6	30 15.6	"
At " " 35.....	84	18	5	1911.7	30 07.7	30 04.7	"
42.05 W.—" " 31.....	84	18	5	1911.7	30 39.6	30 35.6	"
8.00 W.—N. E. cor. sec. 16.....	24	19	5	1909.8	25 54.3	15 52.0	T. H. Plunkett.
30.00 N.—" " 30.....	24	19	5	1909.8	25 49.4	25 50.1	"
At " " 11.....	24	19	5	1911.6	25 45.1	25 42.6	C. H. Taggart.
33.00 E.—N. W. " " 18.....	24	19	5	1911.7	25 53.3	25 39.3	"
At N. E. " " 32.....	40	19	5	1910.4	26 53.0	26 54.9	J. B. McFarlane.
32.00 S.—N. E. " " 26.....	41	19	5	1909.5	26 27.8	"	A. McFee.
8.00 S.—" " 1.....	41	19	5	1909.4	26 23.0	26 29.9	"
4.00 N.—" " 27.....	41	19	5	1909.5	26 30.5	26 43.7	"
At " " 10.....	42	19	5	1909.5	26 23.8	26 34.0	"
10.00 S.—" " 1.....	42	19	5	1909.5	26 24.1	26 33.3	"
70.00 W.—" " 23.....	46	19	5	1911.6	27 36.4	27 34.3	A. L. McNaughton
70.00 S.—" " 16.....	46	19	5	1911.6	27 42.5	27 33.0	"
62.00 S.—" " 2.....	47	19	5	1910.7	27 53.9	27 56.7	"
50.00 S.—" " 4.....	47	19	5	1910.7	28 08.8	28 10.8	"
15.00 S.—" " 3.....	47	19	5	1910.7	27 59.6	27 59.6	"
45.00 S.—" " 11.....	47	19	5	1910.6	28 02.5	27 57.6	"
15.61 N.—" " 23.....	55	19	5	1911.4	28 25.6	28 24.4	L. E. Fontaine.
1.21 N.—" " 8.....	56	19	5	1911.8	28 39.5	28 33.5	"
10.00 N.—" " 24.....	80	19	5	1911.8	29 03.2	"	G. J. Lonergan.
At " " 36.....	24	20	5	1909.8	25 53.1	25 56.8	T. H. Plunkett.
At " " 18.....	25	20	5	1910.9	25 51.1	25 49.3	D. A. Smith.
24.00 W.—" " 10.....	25	20	5	1911.7	25 55.1	25 53.1	C. H. Taggart.
15.00 E.—" " 31.....	43	20	5	1910.7	27 23.2	27 23.7	O. Rolfsen.
30.00 S.—" " 28.....	43	20	5	1910.8	27 11.8	27 11.8	"
36.00 S.—" " 16.....	43	20	5	1910.8	27 06.5	27 11.6	"
11.50 S.—" " 29.....	43	20	5	1910.8	27 14.6	27 15.7	"
22.00 S.—" " 20.....	43	20	5	1910.8	27 12.8	"	"
45.00 S.—" " 34.....	43	20	5	1911.8	27 20.5	27 17.5	J. Francis.
53.00 S.—" " 22.....	43	20	5	1911.8	27 12.7	27 08.7	"
11.00 W.—" " 11.....	43	20	5	1911.8	27 04.2	27 03.2	"
28.00 N.—" " 11.....	43	20	5	1911.8	27 02.8	26 58.8	"
18.00 N.—" " 18.....	43	20	5	1911.8	27 12.0	27 10.0	"
15.00 W.—" " 33.....	44	20	5	1910.4	27 35.4	27 37.5	O. Rolfsen.
8.00 N.—" " 21.....	44	20	5	1910.5	27 26.4	37 30.2	"
12.00 N.—" " 26.....	44	20	5	1910.5	27 23.4	27 36.8	"
7.00 S.—" " 27.....	44	20	5	1910.5	27 23.4	27 26.8	"
49.00 N.—" " 8.....	44	20	5	1911.7	27 29.4	27 27.4	J. Francis.
60.00 S.—" " 19.....	44	20	5	1911.8	27 32.3	27 29.3	"
15.00 N.—" " 7.....	44	20	5	1911.8	27 28.5	27 25.5	"
2.00 S.—" " 7.....	45	20	5	1910.6	27 55.7	27 54.8	"
5.00 S.—" " 13.....	45	20	5	1911.7	27 51.9	27 42.1	A. L. McNaughton
10.00 S.—" " 12.....	46	20	5	1911.7	28 03.5	27 53.5	"
60.00 S.—" " 27.....	47	20	5	1911.8	27 58.3	27 50.3	"
At N. E. cor. sec. 12.....	48	20	5	1910.5	28 11.9	"	"
50.00 S.—N. E. cor. sec. 8.....	48	20	5	1911.8	28 12.4	28 08.4	"
12.91 S.—" " 24.....	51	20	5	1911.3	28 07.3	28 08.7	L. E. Fontaine.
3.84 N.—" " 22.....	55	20	5	1911.4	28 22.6	"	"
41.00 N.—" " 29.....	76	20	5	1911.8	30 02.7	29 59.5	G. J. Lonergan.
35.75 W.—" " 31.....	84	20	5	1911.7	30 34.5	30 31.5	A. H. Hawkins.
At " " 24.....	25	21	5	1910.9	26 05.6	26 06.8	D. A. Smith.
20.00 S.— $\frac{1}{4}$ N. by sec. 34.....	25	21	5	1910.8	25 52.4	25 51.5	W. J. Deans.
At N. E. cor. sec. 35.....	25	21	5	1910.8	25 58.8	25 58.9	"



SESSIONAL PAPER No. 25b

TABLE No. 4.—Continued.

Place.	Tp.	Rge.	M r.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
20.00 W.—N. E. cor. sec. 32.....	25	21	5	1910.9	25 52.9	25 53.7	W. J. Deans.
71.50 S.—" " 36.....	25	21	5	1910.9	26 00.6	26 02.4	"
40.00 W.—" " 25.....	25	21	5	1910.9	25 59.0	26 00.8	"
30.00 N.—" " 26.....	25	21	5	1910.9	26 00.2	25 59.0	"
7.00 S.—" " 4.....	26	21	5	1910.8	26 00.1	.....	"
At Centre " 10.....	26	21	5	1910.8	25 57.8	26 00.9	"
15.00 E.—N. E. " 4.....	26	21	5	1910.8	25 52.2	25 56.3	"
8.00 S.—" " 3.....	26	21	5	1910.8	25 50.4	25 52.0	"
10.00 S.—" " 9.....	26	21	5	1910.8	25 59.2	26 00.3	"
40.00 E.—" " 8.....	26	21	5	1910.9	25 50.0	.....	"
40.00 S.—" " 6.....	26	21	5	1910.9	25 46.2	25 47.0	"
At centre sec. 5.....	26	21	5	1910.9	25 54.6	25 55.4	"
22.00 W.— $\frac{1}{4}$ post on E. by sec. 6.....	27	21	5	1911.0	26 25.4	26 22.3	P. B. Street
21.40 S.—" N. " 7.....	27	21	5	1911.0	26 15.7	26 18.6	"
60.00 W.—N. E. cor. sec. 36.....	43	21	5	1910.7	27 24.3	27 22.3	O. Rolfson.
58.00 S.—" " 1.....	44	21	5	1910.7	27 28.3	27 27.8	"
45.85 W.—" " 36.....	44	21	5	1910.6	27 46.4	27 51.5	J. B. McFarlane.
29.63 W.—" " 35.....	44	21	5	1910.6	27 51.0	27 52.1	"
1.43 W.—" " 33.....	44	21	5	1910.6	27 46.6	27 51.2	"
56.40 W.—" " 32.....	44	21	5	1910.6	27 47.7	27 50.8	"
41.00 S.—" " 14.....	45	21	5	1910.6	27 57.0	.....	J. Francis.
2.00 N.—" " 12.....	48	21	5	1911.9	28 16.7	28 12.2	A. L. McNaughton
10.00 S.—" " 22.....	48	21	5	1911.9	28 17.0	28 12.5	"
52.00 S.—" " 31.....	48	21	5	1910.7	27 56.4	27 58.4	"
At " " 19.....	48	21	5	1910.7	27 54.9	27 54.9	"
70.00 S.—" " 32.....	43	21	5	1910.8	27 51.0	27 57.7	"
50.00 S.—" " 33.....	48	21	5	1910.8	27 59.9	28 02.1	"
53.60 S.—" " 34.....	52	21	5	1909.7	27 40.0	27 45.8	L. E. Fontaine.
20.00 W.—N. E. cor. sec. 20.....	76	21	5	1911.8	30 00.2	29 58.2	G. J. Lonergan
At " " 11.....	27	22	5	1908.4	25 05.8	25 15.4	T. H. Plunkett
12.00 W.— $\frac{1}{4}$ cor. E. by sec. 25.....	27	22	5	1910.9	26 11.2	26 08.1	P. B. Street
12.00 W.—" " 25.....	27	22	5	1910.9	26 06.8	26 09.7	"
63.35 W.—N. E. cor. sec. 36.....	44	22	5	1910.6	27 42.7	27 48.3	J. B. McFarlane
43.82 W.—" " 32.....	44	22	5	1910.7	27 42.8	27 46.6	"
38.72 N.—" " 31.....	45	22	5	1910.8	27 45.8	27 48.9	"
39.78 N.—" " 32.....	45	22	5	1910.8	27 45.9	.....	"
1.65 S.—" " 12.....	45	22	5	1910.6	27 46.1	27 50.2	"
65.10 N.—" " 12.....	45	22	5	1910.6	27 48.6	27 52.2	"
27.53 N.—" " 2.....	45	22	5	1910.6	27 41.7	27 44.3	"
48.57 W.—" " 11.....	45	22	5	1910.6	27 39.0	27 42.1	"
73.45 N.—" " 3.....	45	22	5	1910.6	27 41.0	27 43.6	"
28.40 W.—" " 10.....	45	22	5	1910.6	27 45.8	27 48.9	"
49.49 N.—" " 15.....	45	22	5	1910.7	27 45.7	27 47.5	"
26.32 N.—" " 24.....	45	22	5	1910.7	27 51.5	27 53.5	"
15.40 N.—" " 23.....	45	22	5	1910.7	27 51.9	27 53.9	"
34.17 W.—" " 34.....	45	22	5	1910.7	27 47.2	27 52.2	"
37.96 N.—" " 22.....	45	22	5	1910.7	27 50.2	27 50.7	"
29.46 W.—" " 34.....	45	22	5	1910.7	27 50.1	27 52.1	"
28.41 W.—" " 31.....	45	22	5	1910.7	27 53.9	27 56.9	"
37.15 W.—" " 33.....	45	22	5	1910.7	27 48.2	27 50.2	"
59.94 W.—" " 32.....	45	22	5	1910.7	27 46.2	.....	"
5.50 W.—" " 20.....	45	22	5	1910.7	27 55.6	27 51.0	"
15.73 N.—" " 30.....	45	22	5	1910.8	27 51.4	27 54.5	"
66.25 N.—" " 6.....	46	22	5	1910.8	27 41.2	27 42.3	"
38.23 W.—" " 7.....	46	22	5	1910.8	27 47.2	.....	"
5.00 N.—" " 1.....	49	22	5	1910.7	27 58.9	.....	A. L. McNaughton
30.00 N.—" " 3.....	49	22	5	1910.8	27 58.8	.....	"
At " " 4.....	49	22	5	1910.8	27 47.8	27 48.9	"
27.00 N.—" " 35.....	48	22	5	1910.8	27 50.4	27 49.5	"
3.83 S.—" " 22.....	51	22	5	1911.3	27 24.6	.....	L. E. Fontaine
17.25 N.—" " 32.....	52	22	5	1910.9	27 06.3	27 07.7	"
24.36 N.—" " 11.....	52	22	5	1909.7	27 21.0	27 27.0	"
12.18 N.—" " 13.....	54	22	5	1911.4	28 44.2	28 46.0	"
45.00 E.—" " 22.....	76	22	5	1911.8	29 57.0	29 54.0	G. J. Lonergan
20.00 N.—" " 23.....	76	22	5	1911.8	29 55.6	29 51.6	"
At " " 32.....	44	23	5	1911.4	27 45.6	27 48.4	J. Francis
33.28 N.—" " 36.....	44	23	5	1910.7	27 50.4	27 51.2	J. B. McFarlane



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TABLE No. 4.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
					° ' "	° ' "	
59.45 N.—N.E. cor. sec. 1.....	45	23	5	1910.7	27 46.8	.....	J. B. McFarlane.
74.10 N.—" " " 12.....	45	23	5	1910.7	27 49.3	27 49.3	"
27.77 N.—" " " 36.....	45	23	5	1910.7	28 01.3	28 01.3	"
20.00 N.—" " " 29.....	45	23	5	1911.5	27 46.2	27 46.4	J. Francis
20.00 N.—" " " 31.....	45	23	5	1911.5	27 48.8	27 53.0	"
56.00 S.—" " " 31.....	45	23	5	1911.5	27 49.5	27 52.7	"
65.00 W.—" " " 12.....	45	23	5	1911.4	27 45.2	27 47.0	"
19.00 S.—" " " 14.....	45	23	5	1911.4	27 45.2	.....	"
42.00 S.—" " " 22.....	45	23	5	1911.4	27 45.1	27 46.9	"
15.00 N.—" " " 10.....	45	23	5	1911.4	27 49.2	27 50.0	"
25.60 S.—" " " 15.....	45	23	5	1911.4	27 45.2	27 45.0	"
7.50 S.—" " " 21.....	45	23	5	1911.4	27 36.5	27 43.3	"
5.00 N.—" " " 9.....	45	23	5	1911.4	27 36.0	27 39.8	"
7.00 N.—" " " 16.....	45	23	5	1911.4	27 48.1	27 52.5	"
30.00 N.—" " " 4.....	45	23	5	1911.4	27 43.0	27 45.4	"
55.50 W.—" " " 36.....	45	23	5	1911.4	27 41.9	27 43.3	"
22.00 N.—" " " 35.....	45	23	5	1911.4	27 40.7	27 43.1	"
55.00 S.—" " " 34.....	45	23	5	1911.4	27 30.0	.....	"
At " " " 33.....	45	23	5	1911.4	27 40.6	27 44.0	"
6.00 S.—" " " 33.....	45	23	5	1911.5	27 45.0	27 49.1	"
4.00 S.—" " " 28.....	45	23	5	1911.5	27 38.3	27 42.4	"
30.00 W.—" " " 31.....	45	23	5	1911.5	27 43.5	27 47.6	"
46.00 W.—" " " 32.....	45	23	5	1911.5	27 53.3	.....	"
24.00 N.—" " " 9.....	46	23	5	1911.5	27 46.8	27 48.9	"
22.00 N.—" " " 5.....	46	23	5	1911.5	27 44.4	27 48.6	"
35.00 S.—" " " 19.....	46	23	5	1911.6	27 53.6	27 54.1	"
53.17 N.—" " " 1.....	46	23	5	1910.8	27 57.4	.....	J. B. McFarlane.
36.00 N.—" " " 5.....	49	23	5	1910.5	27 56.2	28 01.6	J. Francis.
44.00 W.—" " " 8.....	49	23	5	1910.6	28 01.4	28 04.5	"
5.71 N.—" " " 24.....	53	23	5	1909.7	28 45.4	28 49.4	L. E. Fontaine.
30.00 N.—S.E. " " 10.....	83	23	5	1911.6	31 43.8	31 42.7	G. J. Lonergan.
At N.E. " " 12.....	85	23	5	1911.6	31 37.5	31 37.4	"
15.00 S.—N.E. " " 36.....	45	24	5	1911.5	27 52.2	27 55.4	J. Francis.
41.00 S.—" " " 2.....	46	24	5	1911.6	27 58.7	27 57.6	"
8.00 S.—" " " 3.....	46	24	5	1911.6	27 56.8	.....	"
28.00 S.—" " " 13.....	46	24	5	1911.6	27 59.1	27 58.6	"
3.50 N.—" " " 14.....	46	24	5	1911.6	27 49.8	27 50.3	"
At " " " 23.....	46	24	5	1911.6	27 45.2	27 43.7	"
At " " " 22.....	46	24	5	1911.6	28 03.7	28 02.2	"
28 00 W.—" " " 21.....	46	24	5	1911.7	27 59.1	27 56.1	"
22.50 N.—N.E. cor. sec. 21.....	46	24	5	1911.7	27 55.9	27 51.9	J. Francis.
28.00 N.—" " " 20.....	46	24	5	1911.7	27 58.8	27 55.8	"
65.00 N.—" " " 19.....	46	24	5	1911.7	28 00.4	27 57.4	"
7.00 W.—" " " 19.....	48	24	5	1910.5	28 04.4	28 07.2	"
42.00 S.—" " " 20.....	48	24	5	1910.5	28 05.6	28 10.9	"
12.00 E. 32.50 S.—N.E. cor. sec. 7.....	49	24	5	1910.5	28 12.1	28 12.5	"
64.03 S.—N.E. cor. sec. 3.....	52	24	5	1909.7	28 32.2	28 30.2	L. E. Fontaine.
5.00 N.—S.E. " " 25.....	48	25	5	1910.4	27 50.5	27 55.4	J. Francis.
10.00 S.—N.E. " " 23.....	48	25	5	1910.4	27 50.1	27 54.8	"
10.00 W.—" " " 24.....	48	25	5	1910.5	27 59.2	28 02.6	"
50.00 N.—S.E. " " 1.....	49	25	5	1910.4	28 03.9	28 07.5	"
40.00 N.—N.E. " " 1.....	49	25	5	1910.4	28 02.3	28 04.4	"
40.00 S.—" " " 34.....	51	25	5	1910.8	28 26.8	28 32.9	A. L. Cumming.
17.00 N.—" " " 7.....	51	25	5	1910.7	28 23.3	28 24.3	"
15.00 W.—S.E. " " 5.....	51	25	5	1909.4	28 03.5	28 03.2	J. B. McFarlane.
47.62 W.—N.E. " " 32.....	56	25	5	1909.4	28 54.7	29 02.4	A. H. Hawkins.
20.00 N.—" " " 28.....	26	26	5	1911.6	26 02.7	25 59.6	M. P. Bridgland.
15.00 W.—" " " 20.....	50	26	5	1909.4	27 46.3	27 50.0	J. B. McFarlane.
10.00 S. 39°48' 5 E.—N.E. cor. 32.....	50	26	5	1909.4	27 56.6	28 00.3	"
At N.E. cor. sec. 32.....	50	26	5	1909.4	28 00.0	27 54.7	"
30.00 S.—" " " 29.....	50	26	5	1909.4	28 00.1	.....	"
70.00 S.—" " " 33.....	50	26	5	1909.4	27 48.4	27 49.6	"
8.00 E.—" " " 32.....	50	26	5	1909.3	27 55.9	27 57.9	"
10.00 S.—" " " 24.....	51	26	5	1910.6	28 31.2	28 34.3	A. L. Cumming.
At " " " 35.....	51	26	5	1910.7	28 29.8	28 31.8	"
12.00 S.—" " " 28.....	51	26	5	1910.7	28 26.1	28 29.1	"
At N.E. cor. sec. 8.....	51	26	5	1910.7	28 26.4	28 26.4	"



SESSIONAL PAPER No. 25b

TABLE No. 4.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
7.00 N.—N.E. cor. sec. 13.....	51	26	5	1910.7	28 25.8	28 24.8	A. L. Cumming.
At " " 19.....	51	26	5	1910.7	28 21.4	28 21.4	"
At " " 12.....	51	26	5	1909.3	28 26.1	28 28.1	J. B. McFarlane.
7.00 S.—" " 26.....	52	26	5	1910.4	28 26.6	28 31.7	A. L. Cumming.
11.00 E.—" " 23.....	52	26	5	1910.4	28 27.8	28 34.9	"
51.00 S.—" " 27.....	52	26	5	1910.5	28 25.7	28 28.5	"
11.00 E.—" " 21.....	52	26	5	1910.5	28 20.9	28 25.7	"
4.00 W.—" " 12.....	52	26	5	1910.5	28 22.7	28 26.1	"
10.00 N.—" " 30.....	52	26	5	1910.6	28 21.3	28 23.4	"
At " " 9.....	52	26	5	1910.6	28 24.6	28 27.7	"
29 44 W.—" " 33.....	56	26	5	1909.4	28 58.2	28 55.9	A. H. Hawkins.
41.23 W.—" " 36.....	56	26	5	1909.4	28 59.0	28 59.7	"
40.00 W.—" " 34.....	56	26	5	1909.4	28 55.7	28 56.4	"
38.00 S.—" " 32.....	48	27	5	1911.4	27 33.2	27 37.6	G. H. Herriot.
37.02 S.—" " 33.....	48	27	5	1911.5	27 32.4	27 35.5	"
2.00 N.—" " 5.....	49	27	5	1911.4	27 55.2	27 47.6	"
10.00 N.—" " 15.....	49	27	5	1909.5	27 50.0	27 55.2	J. B. McFarlane.
At " " 10.....	49	27	5	1909.5	27 50.8	26 48.4	"
45.00 W.—" " 10.....	49	27	5	1909.5	27 44.7	27 53.3	"
49.00 S.—" " 23.....	50	27	5	1909.4	27 46.4	27 50.8	"
17.00 W.—" " 11.....	50	27	5	1909.4	27 46.8	27 51.7	"
55.00 E.—" " 11.....	50	27	5	1909.4	27 54.3	27 50.2	"
49.00 S.—" " 23.....	50	27	5	1909.4	27 58.6	27 54.5	"
6.00 S.—" " 2.....	50	27	5	1909.4	27 45.0	"	"
35.00 S.—" " 11.....	50	27	5	1909.4	27 49.6	27 52.5	"
42.00 S.—" " 11.....	50	27	5	1909.4	28 01.4	27 55.3	"
31.10 W.—" " 35.....	56	27	5	1909.4	29 11.4	29 14.3	A. H. Hawkins.
46.62 W.—" " 34.....	56	27	5	1909.4	28 59.7	29 00.6	"
At " " 12.....	48	28	5	1909.5	26 51.0	26 55.4	J. B. McFarlane.
40.00 S.—" " 13.....	48	28	5	1909.5	27 11.3	27 04.7	"
32.00 W.—" " 11.....	48	28	5	1909.6	27 05.8	27 10.9	"
44.00 S.—" " 14.....	48	28	5	1909.6	27 20.3	27 12.4	"
14.00 E.—" " 29.....	20	29	5	1910.7	25 39.7	25 39.7	G. H. Blanchet.
At S. W. cor. sec. 24.....	20	1	6	1908.9	24 49.3	24 55.4	T. H. Plunkett.
15.00 N.— $\frac{1}{4}$ on E. By. sec. 26.....	21	1	6	1910.6	25 56.4	25 57.5	G. H. Blanchet.
At N. E. cor. sec. 33.....	21	1	6	1909.6	26 00.7	26 02.8	T. H. Plunkett.
At about centre sec. 20.....	22	1	6	1910.8	25 58.9	25 56.0	P. B. Street.
" " 20.....	22	1	6	1910.8	25 47.7	25 50.8	"
40.00 S.—N. E. cor. sec. 5.....	24	1	6	1909.7	25 52.2	25 52.2	E. W. Robinson.
65.00 S.—" " 5.....	24	1	6	1909.7	25 44.9	25 51.9	"
50.00 S.—" " 21.....	45	1	6	1909.7	26 56.1	26 59.1	J. B. McFarlane.
4.00 N.—" " 17.....	45	1	6	1909.7	26 57.9	27 00.9	"
60.00 W.—" " 5.....	45	1	6	1909.7	26 52.9	27 02.9	"
20.00 W.—" " 5.....	45	1	6	1909.7	27 00.1	27 00.1	"
75.00 S.—" " 3.....	46	1	6	1909.7	27 00.1	27 04.1	"
17.00 S.—" " 16.....	46	1	6	1909.7	26 58.6	27 08.4	"
15.00 N.—" " 21.....	46	1	6	1909.7	27 10.3	27 11.1	"
72.00 S.—" " 16.....	47	1	6	1909.6	26 55.6	26 58.7	"
56.00 W.— $\frac{1}{4}$ sec. E. By. sec. 22.....	47	1	6	1909.6	27 00.9	27 09.0	"
20.00 W.—" " 22.....	47	1	6	1909.6	27 11.8	27 14.9	"
At S. E. cor. sec. 5.....	47	1	6	1909.7	27 11.0	27 14.8	"
At N. E. " " 16.....	47	1	6	1909.6	27 03.5	27 15.6	"
11.00 E.—N. E. cor. sec. 17.....	47	1	6	1909.6	27 14.0	27 11.1	"
Intersection of 15th Base Line and 6th Meridian.....	56	1	6	1909.4	28 45.8	28 52.5	A. H. Hawkins.
20.03 W.—N. E. cor. sec. 35.....	56	1	6	1909.5	28 41.1	28 53.7	"
45.16 W.—" " 31.....	56	1	6	1909.4	28 51.1	28 58.6	"
34.79 W.—" " 32.....	56	1	6	1909.4	28 33.5	28 46.0	"
36.92 W.—" " 33.....	56	1	6	1909.5	28 50.5	28 55.1	"
5.00 W.—" " 36.....	60	1	6	1909.8	28 50.3	"	"
24.40 W.—" " 35.....	60	1	6	1909.8	28 46.3	28 47.0	"
29.44 W.—" " 33.....	60	1	6	1909.8	28 39.4	28 47.1	"
32.00 W.—" " 33.....	64	1	6	1909.7	29 05.1	29 10.9	G. McMillan.
60.00 N.—S. E. " " 6.....	82	1	6	1911.6	30 31.4	30 28.9	G. J. Lonergan.
At N. E. " " 13.....	22	2	6	1909.6	26 08.9	"	T. H. Plunkett.
10 chs. E.—N.E. " " 16.....	23	2	6	1909.0	24 58.6	"	E. W. Robinson.
5 chs. N.—" " 20.....	23	2	6	1908.5	25 00.5	25 10.0	T. H. Plunkett.



3 GEORGE V, A. 1913

TABLE No. 4.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912 0	
At N.E. cor. sec. 13.....	23	2	6	1911.7	25 33.1	25 29.1	M. P. Bridgland.
10.00 N.—" " 26.....	23	2	6	1909.8	25 37.1	25 35.8	E. W. Robinson.
40.00 N.—" " 26.....	23	2	6	1909.8	25 32.4	25 37.1	"
50.00 W.—" " 7.....	23	2	6	1909.6	25 24.4	25 23.5	"
30.00 W.—" " 7.....	23	2	6	1909.6	25 17.9	25 29.0	"
34.00 W.—" " 11.....	23	2	6	1911.0	26 04.5	26 03.4	G. H. Blanchet.
20.00 N.—S. E. " 3.....	23	2	6	1909.7	26 04.1	26 10.1	T. H. Plunkett.
67.00 W.—N. E. cor. S. E. $\frac{1}{4}$ sec. 2.....	23	2	6	1909.7	25 56.2	25 47.2	"
10.00 S.—N. E. cor. sec. 5.....	24	2	6	1909.7	25 46.7	25 49.7	E. W. Robinson.
40.00 S.—" " 5.....	24	2	6	1909.7	25 40.5	25 50.5	"
15.00 W.—" " 4.....	24	2	6	1909.7	25 46.2	"	"
40.00 W.—" " 4.....	24	2	6	1909.7	25 42.0	25 53.8	"
30.00 W.—" " 27.....	24	2	6	1909.5	25 43.2	25 42.6	"
40.00 W.—" " 27.....	24	2	6	1909.5	25 40.1	25 48.5	"
9.50 W.—N. E. cor. L. S. $\frac{1}{4}$ sec. 10.....	24	2	6	1910.8	25 58.3	25 55.4	P. B. Street.
9.50 W.—" " 27.....	24	2	6	1910.8	25 58.6	26 06.7	"
40.00 E.—N. E. cor. sec. 9.....	26	2	6	1909.5	25 48.6	25 47.8	E. W. Robinson.
10.00 N.—Centre sec. 10.....	26	2	6	1909.5	25 39.2	25 52.4	"
40.00 E.—N. E. cor. sec. 20.....	26	2	6	1909.5	25 50.7	25 49.3	"
15.00 E.—" " 20.....	26	2	6	1909.5	25 43.7	25 53.8	"
At " 16.....	26	2	6	1909.5	25 47.0	25 48.2	"
At " 16.....	26	2	6	1909.5	25 42.7	25 51.9	"
40.00 S.—" " 32.....	26	2	6	1909.4	25 50.4	"	"
40.00 S.—" " 32.....	26	2	6	1909.4	26 00.2	25 49.1	"
30.00 W.—" " 6.....	27	2	6	1909.5	26 15.0	26 17.6	"
5.00 W.—" " 6.....	27	2	6	1909.5	26 10.2	26 23.8	"
35.00 W.—" " 1.....	45	2	6	1909.7	26 52.6	"	J. B. McFarlane.
At " 1.....	45	2	6	1909.7	26 59.4	"	"
72.00 W.—" " 11.....	45	2	6	1909.7	26 56.2	27 04.2	"
25.00 W.—" " 11.....	45	2	6	1909.7	27 00.5	27 00.5	"
19.00 E.—" " 3.....	45	2	6	1909.7	26 57.4	27 05.4	"
16.00 N.—" " 3.....	45	2	6	1909.7	26 54.3	26 56.8	"
6.00 E.—" " 7.....	45	2	6	1909.8	27 09.3	27 07.0	"
55.00 W.—" " 7.....	45	2	6	1909.8	27 01.1	27 05.8	"
59.89 W.—" " 36.....	56	2	6	1909.5	28 42.5	28 52.7	A. H. Hawkins.
31.49 W.—" " 32.....	56	2	6	1909.6	28 51.3	"	"
2.22 W.—" " 33.....	56	2	6	1909.5	28 44.7	28 47.9	"
27.67 W.—" " 35.....	56	2	6	1909.5	28 42.3	28 48.5	"
71.00 W.—" " 35.....	60	2	6	1909.8	30 12.8	30 20.5	"
At " 32.....	60	2	6	1909.8	29 05.0	29 06.7	"
64.00 W.—" " 34.....	64	2	6	1909.7	29 04.8	29 10.8	G. McMillan.
5.00 N.—" " 28.....	71	2	6	1911.6	27 45.2	27 43.7	G. J. Lonergan.
27.00 N.—" " 15.....	45	3	6	1909.8	27 10.8	27 13.5	J. B. McFarlane.
15.00 S.—" " 15.....	45	3	6	1909.8	27 12.6	27 11.3	"
46.00 W.—" " 20.....	45	3	6	1909.8	27 08.7	27 15.4	"
At " 17.....	45	3	6	1909.8	27 20.9	27 15.6	"
56.20 W.—" " 36.....	56	3	6	1909.6	28 38.9	28 36.8	A. H. Hawkins.
47.76 W.—" " 33.....	56	3	6	1909.6	29 29.0	29 29.9	"
79.97 W.—" " 35.....	56	3	6	1909.6	28 27.0	28 27.9	"
65.00 W.—" " 35.....	60	3	6	1909.8	28 45.5	"	"
At " 31.....	60	3	6	1909.8	28 40.8	"	"
30.00 W.—" " 33.....	64	3	6	1909.7	29 08.0	29 12.0	G. McMillan.
40.06 W.—" " 21.....	80	3	6	1908.5	29 52.9	30 02.4	J. B. Saint Cyr.
3.00 S.—" " 24.....	45	4	6	1909.8	27 12.9	27 16.2	J. B. McFarlane.
25.00 N.—" " 14.....	45	4	6	1909.8	27 14.2	27 20.5	"
3.00 N.—" " 14.....	45	4	6	1909.8	27 19.4	27 14.7	"
43.66 W.—" " 33.....	56	4	6	1909.6	28 35.0	28 37.1	A. H. Hawkins.
21.80 W.—" " 34.....	56	4	6	1909.6	28 29.0	28 25.1	"
2.08 W.—" " 36.....	56	4	6	1909.6	28 41.1	28 44.0	"
73.33 W.—" " 34.....	60	4	6	1909.8	28 41.4	"	"
13.00 W.—" " 31.....	64	4	6	1909.7	29 04.0	29 09.0	G. McMillan.
At " 10.....	79	4	6	1911.7	29 59.4	29 55.7	G. J. Lonergan.
60.00 E.—" " 9.....	79	4	6	1911.8	30 09.0	30 05.0	"
41.00 W.—" " 7.....	79	4	6	1909.7	30 28.6	30 30.6	J. B. Saint Cyr.
40.00 S.—" " 21.....	80	4	6	1908.5	29 56.9	30 08.2	"
40.05 W.—" " 7.....	80	4	6	1908.5	29 52.5	30 03.0	"
Sta. 33, traverse E. side Mabel Lake.	20	5	6	1910.8	26 21.6	26 20.7	T. H. Plunkett.



SESSIONAL PAPER No. 25b

TABLE No. 4.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
0.68 W.—N. E. cor. sec. 31 .....	56	5	6	1909.6	28 37.3	28 36.4	A. H. Hawkins.
19.76 W.—" 32 .....	56	5	6	1909.6	28 35.2	28 36.3	"
19.76 W.—N. E. cor. sec. 32 .....	56	5	6	1909.6	28 17.3	28 25.4	A. H. Hawkins.
16.47 W.—" 33 .....	60	5	6	1910.6	28 42.5	28 45.0	G. McMillan.
21.00 W.—" 32 .....	64	5	6	1909.8	28 58.6	29 00.3	"
At " 32 .....	74	5	6	1911.7	29 24.3	29 22.3	G. J. Lonergan.
At " 4 .....	77	5	6	1909.6	29 32.0	29 27.1	J. B. Saint Cyr.
At " 26 .....	77	5	6	1909.5	29 48.6	29 51.0	"
At " 23 .....	77	5	6	1909.5	29 50.9	29 54.3	"
At " 30 .....	77	5	6	1909.5	30 01.6	30 03.0	"
20.00 N.—S. E. " 16 .....	77	5	6	1909.6	29 56.6	29 56.7	"
At N. E. " 7 .....	77	5	6	1909.6	29 52.6	29 54.7	"
20.00 S.—N. E. " 21 .....	78	5	6	1909.6	30 13.8	30 19.9	"
At " " 14 .....	78	5	6	1909.7	29 56.6	30 00.4	"
At " " 5 .....	78	5	6	1909.5	30 05.1	30 11.7	"
At " " 32 .....	78	5	6	1909.7	30 25.0	30 30.0	"
At " " 19 .....	78	5	6	1909.7	30 25.8	"	"
12.00 S.—" 1 .....	78	5	6	1908.7	29 47.3	29 53.8	"
At " " 5 .....	79	5	6	1909.8	30 24.2	30 26.9	"
At " " 29 .....	79	5	6	1909.8	30 15.3	30 16.0	"
At " " 16 .....	79	5	6	1909.7	30 23.1	30 26.1	"
At " " 14 .....	79	5	6	1909.7	30 13.6	30 17.6	"
10.00 N.—N. W. cor. sec. 8 .....	79	5	6	1909.8	30 33.2	30 36.9	"
20.00 E.—" 36 .....	79	5	6	1909.4	30 29.7	"	"
17.00 S.—N. E. cor. sec. 7 .....	19	6	6	1911.8	21 19.3	21 15.3	M. P. Bridgland.
40.00 N.—" 9 .....	19	6	6	1909.8	25 38.6	25 38.3	E. W. Robinson.
25.00 N.—" 9 .....	19	6	6	1909.8	25 35.1	25 39.8	"
60 W. 00— $\frac{1}{4}$ cor. E. By. sec. 7 .....	22	6	6	1908.6	26 02.2	"	"
At $\frac{1}{4}$ cor. E. By. sec. 5 .....	22	6	6	1908.6	26 05.7	"	"
10.00 N.—N. E. cor. sec. 23 .....	23	6	6	1908.8	26 05.7	26 13.5	"
At " " 7 .....	23	6	6	1908.8	25 46.3	25 48.1	"
At S. E. cor. sec. 6 .....	23	6	6	1908.8	26 08.3	26 18.1	"
15.80 W.—N. E. cor. sec. 23 .....	56	6	6	1909.6	28 08.3	28 18.4	A. H. Hawkins.
39.00 W.—" 33 .....	56	6	6	1909.6	28 19.8	"	"
10.43 W.—" 31 .....	56	6	6	1909.6	28 10.0	28 08.1	"
50.00 W.—" 34 .....	56	6	6	1909.6	28 09.9	28 19.0	"
At " 34 .....	56	6	6	1909.6	28 00.7	27 59.8	"
At " 35 .....	56	6	6	1909.6	28 21.7	28 19.8	"
38.20 W.—" 34 .....	60	6	6	1910.6	28 22.6	28 24.1	G. McMillan.
70.00 W.—" 33 .....	64	6	6	1909.8	28 46.9	28 42.6	"
At " 26 .....	77	6	6	1909.9	30 29.7	30 27.7	J. B. Saint Cyr.
At " 33 .....	77	6	6	1909.9	31 19.2	31 22.2	"
At " 30 .....	77	6	6	1909.8	31 14.4	"	"
At " 20 .....	77	6	6	1909.8	31 05.3	31 02.6	"
40.00 E.—" 21 .....	78	6	6	1909.9	31 30.6	31 28.6	"
60.00 N.—S. E. cor. sec. 2 .....	78	6	6	1909.9	31 14.7	"	"
At N. E. " 6 .....	78	6	6	1909.9	31 25.3	31 24.3	"
61.00 S.—" 1 .....	78	6	6	1909.4	30 55.8	31 00.5	"
At S. W. cor. sec. 6 .....	79	6	6	1909.7	31 27.1	31 30.1	"
40.00 S.—N. E. cor. sec. 12 .....	79	6	6	1909.4	30 20.3	"	"
5.00 E.—" 34 .....	18	7	6	1909.8	25 37.4	25 36.1	E. W. Robinson.
30.00 E.—" 34 .....	18	7	6	1909.8	25 32.0	25 37.7	"
20.00 E.—" 27 .....	21	7	6	1908.7	24 43.7	24 54.2	"
26.50 W.— $\frac{1}{4}$ post E. By. sec. 33 .....	21	7	6	1908.7	26 20.5	"	"
15.00 S.—N. E. cor. sec. 17 .....	24	7	6	1910.7	26 05.0	26 05.0	W. J. Deans.
40.00 W.—" 5 .....	24	7	6	1910.7	26 03.8	26 07.8	"
40.00 S.—" 6 .....	24	7	6	1910.7	26 08.1	26 08.1	"
30.00 E.—" 17 .....	24	7	6	1910.7	26 24.1	26 26.1	"
40.00 S.—" 27 .....	24	7	6	1910.8	26 12.5	"	"
30.00 S.—Centre sec. 35 .....	24	7	6	1910.8	26 13.1	26 16.7	"
32.00 W.—" 8 .....	24	7	6	1910.8	25 58.7	25 59.8	"
20.00 E.— $\frac{1}{4}$ E. By. sec. 27 .....	25	7	6	1910.7	25 20.6	25 24.1	D. A. Smith.
10.00 E.—Centre N. By. sec. 24 .....	25	7	6	1910.7	25 36.8	25 39.3	"
40.00 S.—" 11 .....	25	7	6	1910.8	25 36.4	25 36.5	"
3.00 E.—N. E. cor. sec. 7 .....	26	7	6	1910.6	27 29.8	27 25.9	P. B. Street.
3.00 E.—" 7 .....	26	7	6	1910.6	27 14.5	27 23.6	"
5.00 N.—Centre sec. 6 .....	26	7	6	1910.7	26 48.7	26 47.2	"



3 GEORGE V, A. 1913

TABLE No. 4.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
47.40 W.—N.E. cor. sec. 34.....	56	7	6	1909.6	27 58'9"	28 09'0"	A. H. Hawkins.
48.46 W.—" " 34.....	56	7	6	1909.7	27 55'1"	27 54'9"	"
20.03 W.—" " 32.....	56	7	6	1909.7	27 37'4"	27 47'2"	"
19.28 W.—" " 31.....	56	7	6	1909.7	27 44'4"	27 42'4"	"
71.00 W.—" " 34.....	60	7	6	1910.6	27 53'4"	27 51'9"	G. McMillan.
52.32 W.—" " 31.....	64	7	6	1909.8	28 38'6"	28 42'3"	"
At " " 36.....	21	8	6	1908.5	25 38'1"	26 08'6"	E. W. Robinson.
30.00 N.—Centre sec. 32.....	21	8	6	1910.6	26 00'2"	25 59'3"	G. H. Blanchet.
Traverse.....	23	8	6	1910.5	24 57'2"	24 59'0"	"
5.00 W.—Centre sec. 16.....	23	8	6	1910.5	25 03'0"	25 05'8"	"
20.00 S.—N.E. cor. sec. 7.....	23	8	6	1910.5	27 28'9"	27 31'3"	"
6.25 W.—N.W. " 23.....	24	8	6	1910.6	26 24'9"	26 31'0"	W. J. Deans.
25.00 W.— $\frac{1}{4}$ E. By. sec. 22.....	24	8	6	1910.6	25 42'7"	25 47'8"	"
30.00 N.— $\frac{1}{4}$ N. by sec. 23.....	24	8	6	1910.6	26 48'9"	26 54'0"	W. J. Deans.
12.00 W.—center sec. 26.....	24	8	6	1910.6	26 21'4"	26 22'5"	"
16.00 N.—N.E. cor. sec. 22.....	24	8	6	1910.6	26 22'0"	26 23'1"	"
40.00 W.—" " 13.....	24	8	6	1910.7	26 02'8"	26 14'8"	"
40.00 W.—" " 12.....	24	8	6	1910.7	25 50'0"	25 53'0"	"
Center section 13.....	24	8	6	1910.7	25 57'8"	25 58'8"	"
30.00 W.—center section 13.....	25	8	6	1910.6	26 11'1"	26 11'2"	D. A. Smith.
40.00 W.—N.E. cor. sec. 1.....	25	8	6	1910.6	26 09'8"	26 11'9"	"
30.00 E.—" " 13.....	25	8	6	1910.6	25 35'0"	25 36'1"	"
60.00 W.—" " 1.....	25	8	6	1910.7	25 20'9"	25 21'2"	"
1.40 N.—Center sec. 1.....	26	8	6	1910.7	26 31'0"	26 31'8"	P. B. Street.
20.09 W.—N.E. cor. sec. 36.....	56	8	6	1909.7	27 44'7"	27 49'7"	A. H. Hawkins.
58.84 W.—" " 36.....	56	8	6	1909.7	27 39'0"	27 33'0"	"
53.72 W.—" " 33.....	56	8	6	1909.7	27 26'8"	27 25'8"	"
48.14 W.—" " 34.....	56	8	6	1909.7	27 22'5"	27 30'5"	"
10.00 W.—" " 35.....	56	8	6	1909.7	27 41'9"	27 42'9"	"
17.63 W.—" " 31.....	64	8	6	1909.8	28 18'8"	28 17'5"	G. McMillan.
At " " 33.....	70	8	6	1911.7	28 44'8"	28 39'8"	G. J. Lonergan.
At S.E. cor. sec. 3.....	71	8	6	1911.7	29 52'4"	29 50'4"	"
At N.E. cor. sec. 22.....	19	9	6	1911.7	25 58'4"	25 54'7"	M. P. Bridgland.
At " " 15.....	19	9	6	1911.7	25 56'9"	25 53'2"	"
At " " 16.....	19	9	6	1911.8	26 04'1"	26 01'1"	"
32.00 W.—" " 17.....	20	9	6	1909.3	26 01'9"	26 01'9"	T. H. Plunkett.
42.00 W.—" " 17.....	20	9	6	1909.3	25 45'8"	25 52'0"	"
10.00 W.—" " 31.....	22	9	6	1910.6	25 57'6"	25 57'6"	L. D. N. Stewart.
12.00 S.—" " 31.....	22	9	6	1910.7	25 18'4"	25 19'2"	"
At N.E. cor. sec. 28.....	22	9	6	1910.7	25 46'8"	25 46'8"	"
15.00 S.—" " 33.....	22	9	6	1910.7	26 16'7"	26 15'7"	"
2.00 N.—" " 5.....	23	9	6	1910.6	25 23'4"	25 28'5"	"
32.00 S.—" " 15.....	23	9	6	1910.8	25 23'7"	25 27'8"	"
32.00 S.—" " 15.....	23	9	6	1910.8	25 32'6"	25 31'7"	"
40.00 W.—" " 31.....	68	9	6	1909.5	27 33'1"	27 33'1"	G. McMillan.
11.21 E.—" " 32.....	88	9	6	1911.9	31 11'6"	31 07'1"	"
7.57 E.—" " 33.....	88	9	6	1911.9	31 09'7"	31 05'2"	"
40.25 S.—" " 18.....	19	10	6	1909.3	25 29'1"	25 29'1"	T. H. Plunkett.
At S.E. cor. sec. 6.....	19	10	6	1909.4	25 51'9"	25 55'8"	"
At N.E. " " 4.....	20	10	6	1911.8	25 30'9"	25 25'9"	M. P. Bridgland.
40.50 W.—S. E. " " 4.....	20	10	6	1911.8	26 01'0"	26 00'0"	"
At N.E. " " 9.....	20	10	6	1911.8	25 50'1"	25 49'1"	"
At " " 10.....	20	10	6	1911.8	25 36'2"	25 34'2"	"
At " " 11.....	20	10	6	1911.8	25 48'8"	25 46'8"	"
40.25 S.—" " 6.....	20	10	6	1911.8	25 52'4"	25 54'4"	"
At " " 33.....	21	10	6	1910.5	25 46'8"	25 51'6"	W. J. Deans.
20.00 S.—Center sec. 33.....	22	10	6	1910.9	25 24'0"	25 22'4"	L. D. N. Stewart.
15.00 S.—N.E. cor. sec. 33.....	22	10	6	1911.0	25 50'4"	25 46'3"	"
40.00 W.—" " 6.....	22	10	6	1910.3	25 35'7"	25 41'9"	W. J. Deans.
10.00 E.—Center sec. 7.....	22	10	6	1910.4	25 36'8"	25 35'7"	"
10.00 E.—" " 7.....	22	10	6	1910.4	25 26'4"	25 32'3"	"
40.00 N.—N.E. cor. sec. 6.....	22	10	6	1910.4	25 27'7"	25 32'6"	"
At " " 6.....	22	10	6	1910.4	25 39'8"	25 44'7"	"
At " " 7.....	22	10	6	1910.4	25 32'0"	25 36'9"	"
40.00 W.—" " 7.....	22	10	6	1910.4	25 30'9"	25 36'8"	"
10.00 W.— $\frac{1}{4}$ post E. by sec. 18.....	22	10	6	1910.4	25 26'3"	25 30'4"	"



SESSIONAL PAPER No. 25b

TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
65.61 W.—N.E. cor. sec. 17.....	22	10	6	1910.4	25 35.8	.....	W. J. Deans.
65.61 W.—" 17.....	22	10	6	1910.4	25 38.1	25 44.2	"
40.00 W.—" 17.....	22	10	6	1910.4	25 37.2	25 43.3	"
57.54 N.—" 7.....	22	10	6	1910.4	25 36.9	25 41.0	"
40.00 W.—" 4.....	22	10	6	1910.5	25 45.7	25 49.5	"
20.00 W.—" 4.....	22	10	6	1910.5	25 34.8	25 39.6	"
30.00 S.—" 5.....	22	10	6	1910.5	25 34.2	25 40.0	"
40.00 N.—" 5.....	22	10	6	1910.5	25 40.5	25 43.9	"
At " 7.....	23	10	6	1910.5	26 16.9	26 18.3	T. H. Plunkett.
At N.E. cor. N.W. $\frac{1}{4}$ sec. 22	23	10	6	1910.4	26 17.4	26 11.3	"
At " S.E. $\frac{1}{4}$ sec. 9.....	23	10	6	1910.4	25 39.2	25 44.1	"
At " sec. 15.....	23	10	6	1910.4	25 50.6	25 52.5	"
10.00 S.— $\frac{1}{4}$ post E. by sec. 14.....	23	10	6	1910.5	25 33.3	25 31.1	"
32.40 N.—N.E. cor. sec. 11.....	23	10	6	1908.5	25 11.2	25 21.5	E. W. Robinson.
28.00 W.—" 31.....	64	10	6	1910.4	27 15.4	27 13.9	G. McMillan.
65.00 W.—" 31.....	68	10	6	1909.5	28 12.0	28 09.6	"
44.69 E.—" 31.....	88	10	6	1911.9	32 39.1	32 37.6	J. R. Akins.
13.37 E.—" 34.....	88	10	6	1911.9	31 41.7	31 38.2	"
13.95 E.—" 36.....	88	10	6	1911.9	31 34.0	31 30.5	"
35.00 W.— $\frac{1}{4}$ on E. by sec. 14.....	22	11	6	1910.4	26 01.4	26 04.3	G. H. Blanchet.
44.00 N.—N.E. cor. sec. 11.....	22	11	6	1910.3	25 27.9	25 33.1	"
At " 13.....	23	11	6	1910.5	25 43.5	25 46.9	T. H. Plunkett.
25.00 E.—Centre sec. 23.....	23	11	6	1910.5	26 06.6	26 08.0	"
3.00 W.—N.E. cor. sec. 28.....	25	11	6	1909.4	26 19.7	26 14.4	E. W. Robinson.
21.00 E.—" 28.....	25	11	6	1909.4	26 16.0	26 19.7	"
5.00 S.—N.E. cor. sec. 13.....	25	11	6	1909.4	25 55.7	26 00.4	E. W. Robinson.
40.00 S.—" 13.....	25	11	6	1909.4	26 00.4	25 55.1	"
Centre of section 10.....	25	11	6	1909.3	26 14.3	26 14.3	"
" 10.....	25	11	6	1909.3	26 09.6	26 17.6	"
" 7.....	25	11	6	1909.3	26 16.9	26 11.9	"
" 7.....	25	11	6	1909.3	26 11.2	26 21.2	"
41.00 W.—N.E. cor. sec. 30.....	25	11	6	1909.3	26 19.9	26 27.9	"
47.85 W.—" 32.....	64	11	6	1910.5	27 12.9	27 17.1	G. McMillan.
35.00 W.—" 35.....	68	11	6	1909.5	28 15.6	28 21.2	"
37.09 E.—" 34.....	88	11	6	1911.8	32 57.0	32 51.8	J. R. Akins.
75.00 E.—" 35.....	88	11	6	1911.8	32 40.7	32 35.5	"
60.58 E.—" 36.....	88	11	6	1911.8	32 34.7	32 30.5	"
14.34 S.—Centre sec. 18.....	23	12	6	1910.6	26 48.5	26 50.1	T. H. Plunkett.
3.00 N.—N.E. cor. sec. 14.....	25	12	6	1909.3	26 25.4	26 20.6	E. W. Robinson.
30.00 S.—" 14.....	25	12	6	1909.3	26 18.1	26 27.3	"
3.00 W.—" 25.....	25	12	6	1909.3	26 24.8	26 21.8	"
29.46 W.—" 34.....	68	12	6	1909.5	29 20.3	29 21.9	G. McMillan.
1.00 W.— $\frac{1}{4}$ Post N. By. sec. 13.....	17	13	6	1911.5	24 42.1	24 44.3	C. H. Taggart.
20.00 W.—N.E. cor. S.E. $\frac{1}{4}$ sec. 4.....	22	13	6	1910.7	26 59.7	26 59.7	T. H. Plunkett.
10.00 W.—" N.W. " 4.....	22	13	6	1910.7	26 32.6	26 30.6	"
20.00 E.—N.E. cor. sec. 32.....	21	13	6	1910.7	26 26.6	26 27.6	"
13.07 W.—" 34.....	64	13	6	1910.5	28 54.1	28 54.9	G. McMillan.
20.00 W.—" 34.....	68	13	6	1909.5	30 44.2	30 47.4	"
58.59 W.—" 33.....	80	13	6	1911.3	32 11.9	32 10.3	"
51.00 S.—" 13.....	83	13	6	1911.4	32 47.7	32 46.5	O. Rolfson.
17.00 S.—" 36.....	84	13	6	1911.4	33 17.1	33 16.9	"
At N.E. cor. sec. 13.....	85	13	6	1911.3	33 19.6	33 30.7	J. R. Akins.
69.06 N.—N.E. cor. sec. 24.....	85	13	6	1911.4	33 19.5	33 16.3	"
36.74 N.—" 36.....	85	13	6	1911.4	33 14.8	33 14.6	"
39.76 N.—" 1.....	86	13	6	1911.4	33 12.1	33 10.9	"
31.50 S.—" 13.....	86	13	6	1911.4	33 10.2	33 10.0	"
40.50 N.—" 24.....	86	13	6	1911.4	33 10.1	33 10.9	"
22.30 S.—" 25.....	86	13	6	1911.4	33 08.1	33 05.9	"
At " 36.....	86	13	6	1911.4	33 08.5	.....	"
53.59 W.—" 36.....	86	13	6	1911.4	33 07.9	33 07.7	"
25.00 N.—" 12.....	87	13	6	1911.4	33 07.9	33 10.7	"
29.50 N.—" 12.....	87	13	6	1911.4	33 16.3	.....	"
66.30 S.—" 24.....	87	13	6	1911.4	33 18.1	33 18.9	"
5.00 N.—" 25.....	88	13	6	1911.4	33 46.1	33 46.9	"
39.48 N.—" 12.....	88	13	6	1911.4	33 37.0	33 36.8	"
51.00 N.—" 13.....	88	13	6	1911.4	33 38.2	33 40.0	"
3.00 S.—" 21.....	16	14	6	1911.3	21 56.7	21 55.1	J. E. Ross.



TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer.
					Obs'd.	Reduced to 1912.0	
At $\frac{1}{4}$ cor. N. By. sec. 34.....	17	14	6	1911.3	19 52.8	19 53.9	J. E. Ross.
60.00 S.—N. E. cor. sec. 32.....	77	14	6	1911.7	31 54.8	31 51.8	G. J. Lonergan.
8.00 S.—" " 31.....	77	14	6	1911.7	31 42.8	31 40.8	"
50.00 S.—" " 31.....	78	14	6	1911.7	32 10.3	32 07.3	"
5.00 S.—" " 7.....	79	14	6	1911.7	32 17.2	32 14.2	"
61.00 W.—" " 34.....	80	14	6	1911.3	32 07.1	32 11.5	G. McMillan.
8.95 W.—" " 34.....	84	14	6	1911.4	32 58.6	33 00.0	O. Rolfson.
72.33 W.—" " 32.....	84	14	6	1911.4	32 15.6	32 17.0	"
56.22 W.—" " 31.....	84	14	6	1911.4	32 17.8	.....	"
23.00 W.—S.E. cor. sec. 13.....	16	15	6	1911.3	25 29.9	25 29.3	J. E. Ross.
43.00 E.—N.E. " 33.....	17	15	6	1911.5	27 37.2	27 38.3	C. H. Taggart.
At N.E. cor. sec. 16.....	19	15	6	1911.4	27 05.9	27 05.2	J. E. Ross.
7.00 E.—N.E. cor. sec. 2.....	21	15	6	1910.7	25 37.6	25 41.0	R. D. McCaw.
20.00 W.—" " 36.....	77	15	6	1911.7	31 35.3	31 32.3	G. J. Lonergan.
At N.E. cor. sec. 24.....	78	15	6	1911.7	31 50.3	31 47.3	"
68.00 W.—N.E. cor. sec. 32.....	80	15	6	1911.3	32 01.1	32 05.5	A. McMillan.
56.38 W.—" " 34.....	84	15	6	1911.5	32 11.8	32 13.9	O. Rolfson.
79.36 W.—" " 31.....	84	15	6	1911.5	31 47.0	31 48.7	"
1.50 W.—" " 22.....	16	16	6	1911.5	26 54.9	26 56.0	C. H. Taggart.
30.00 W.—S.E. " 24.....	16	16	6	1911.9	27 21.7	27 17.3	"
3.00 S.—N.E. " 32.....	21	16	6	1910.8	26 17.0	26 14.1	R. D. McCaw.
73.00 W.—" " 33.....	80	16	6	1911.3	30 24.7	30 25.8	G. McMillan.
2.44 W.—" " 34.....	84	16	6	1911.5	31 36.3	31 38.5	O. Rolfson.
2.44 W.—" " 34.....	84	16	6	1911.5	31 49.2	31 43.4	"
2.44 W.—" " 34.....	84	16	6	1911.5	31 37.9	31 40.1	"
27.13 W.—" " 35.....	88	16	6	1911.5	31 20.7	31 21.4	J. R. Akins.
63.07 W.—" " 35.....	88	16	6	1911.5	31 22.0	31 24.9	"
57.02 W.—" " 34.....	88	16	6	1911.5	31 32.7	31 36.9	"
69.45 W.—" " 31.....	88	16	6	1911.5	31 49.1	31 53.3	"
6.00 N.—" " 27.....	16	17	6	1912.0	26 18.5	26 13.8	C. H. Taggart.
6.00 N.— $\frac{1}{4}$ cor. E. by sec. 18.....	22	17	6	1910.4	27 22.1	27 29.0	J. E. Ross.
13.00 W.—N.E. cor. sec. 34.....	80	17	6	1911.4	30 34.1	30 32.9	G. McMillan.
80.54 W.—N.E. cor. sec. 36.....	84	17	6	1911.5	31 21.0	31 23.2	O. Rolfson.
12.80 W.—" " 36.....	88	17	6	1911.5	32 04.2	32 02.4	J. R. Akins.
6.53 W.—" " 34.....	88	17	6	1911.6	31 51.6	31 51.5	"
37.00 W.—" " 31.....	88	17	6	1911.6	32 09.3	32 08.2	"
15.00 E.—" " 36.....	17	18	6	1910.9	25 54.9	.....	J. E. Ross.
40.25 S.—N. E. cor. sec. 11.....	18	18	6	1910.8	25 22.1	25 21.3	"
40.00 W.—" " 14.....	19	18	6	1910.9	23 33.1	23 34.0	"
2.00 E.—" " 33.....	21	18	6	1910.8	28 02.9	28 04.0	R. D. McCaw.
10.00 E.—" " 33.....	21	18	6	1910.8	25 01.4	25 01.5	"
37.00 N., 28.00 W.—N. E. cor. 31.....	21	18	6	1910.4	24 38.4	24 41.3	J. E. Ross.
5.00 S.—Centre sec. 20.....	21	18	6	1910.4	24 30.8	24 32.7	"
75.42 W.—N. E. cor. sec. 34.....	84	18	6	1911.6	32 03.9	31 56.8	O. Rolfson.
75.42 W.—" " 34.....	84	18	6	1911.6	31 40.0	31 46.9	"
75.42 W.—" " 34.....	84	18	6	1911.6	31 46.6	31 45.5	"
75.42 W.—" " 34.....	84	18	6	1911.6	31 48.8	31 47.7	"
30.06 W.—N. E. cor. sec. 35.....	88	18	6	1911.6	31 55.7	31 58.6	J. R. Akins.
45.61 W.—" " 33.....	88	18	6	1911.6	31 58.8	32 00.7	"
20.75 W.—" " 31.....	88	18	6	1911.6	31 45.1	31 46.6	"
68.10 W.—" " 31.....	88	18	6	1911.6	31 46.8	31 47.3	"
At Sta. II.—Road Tra. sec. 35.....	17	19	6	1912.0	25 32.2	25 25.5	C. H. Taggart.
32.00 E.—N. E. cor. sec. 27.....	17	19	6	1910.6	25 14.7	25 13.0	R. D. McCaw.
54.00 W.—" " 22.....	21	19	6	1910.4	26 09.8	26 15.9	J. E. Ross.
Sta. O. Watching Ck. Traverse S. W. part sec. 12.....	22	19	6	1910.8	29 23.5	29 25.6	R. D. McCaw.
10.00 N.—Sta. 2 in N. E. part 24.....	22	19	6	1910.8	25 18.7	25 18.4	"
76.88 W.—N. E. cor. sec. 33.....	84	19	6	1911.6	31 32.5	31 32.0	O. Rolfson.
4.28 W.—N. E. cor. sec. 34.....	88	19	6	1911.6	31 32.8	31 35.3	J. R. Akins.
47.70 W.—" " 33.....	88	19	6	1911.6	31 33.1	31 31.6	"
5.00 S.—" " 29.....	17	20	6	1910.6	25 28.6	25 31.7	R. D. McCaw.
7.00 N.—" " 25.....	21	20	6	1910.4	25 47.0	25 53.1	J. E. Ross.
At $\frac{1}{4}$ cor. E. by. sec. 1.....	22	20	6	1910.4	28 52.4	28 58.5	"
34.00 S.—N. E. cor. sec. 32.....	23	20	6	1910.7	26 34.0	26 35.8	"



SESSIONAL PAPER No. 25b

TABLE No. 4—Continued.

Place.	Tp.	Rge.	Mer.	Date.	DECLINATION.		Observer
					Obs'd.	Reduced to 1912.0	
					° /	° /	
35.00 S.—N. E. cor. sec. 16.....	24	20	6	1910.7	26 18.4	26 19.4	J. F. Ross.
34.21 W.—" " 34.....	84	20	6	1911.6	31 08.2	31 07.7	O. Rolfson.
21.00 W.—" " 36.....	84	20	6	1911.6	31 11.5	31 11.0	"
0.47 W.—" " 31.....	84	20	6	1911.6	31 05.8	"	"
53.08 W.—" " 33.....	84	20	6	1911.6	31 06.9	31 04.4	"
4.00 W.—" " 34.....	88	20	6	1911.6	31 08.2	31 09.7	J. R. Akins.
47.00 W.—" " 32.....	88	20	6	1911.6	31 14.4	31 14.9	"
10.00 N.—" " 2.....	22	21	6	1910.5	27 45.7	27 48.1	J. E. Ross.
At 1/4 cor. N. by. sec. 28.....	22	21	6	1910.6	26 11.7	26 17.8	"
25.00 S.—N. E. cor. sec. 4.....	23	21	6	1910.6	25 44.0	25 48.1	"
20.00 S.—" " 11.....	24	21	6	1910.7	27 01.4	27 03.9	"
15.31 W.—" " 36.....	84	21	6	1911.6	31 15.3	31 14.8	O. Rolfson.
22.09 W.—" " 35.....	84	21	6	1911.7	31 09.1	31 06.3	"
70.98 W.—" " 33.....	84	21	6	1911.7	30 46.3	30 43.3	"
23.82 W.—" " 36.....	88	21	6	1911.6	31 30.9	31 31.4	J. R. Akins.
1.56 W.—" " 34.....	88	21	6	1911.6	31 39.8	31 38.3	"
31.32 W.—" " 33.....	88	21	6	1911.6	31 33.6	31 33.1	"
24.71 W.—" " 32.....	88	21	6	1911.6	31 47.4	31 44.9	"
69.62 W.—" " 31.....	88	21	6	1911.6	31 33.3	"	"
6.00 E.—" " 4.....	16	22	6	1910.5	25 44.0	25 47.4	R. D. McCaw.
12.00 S.—" " 13.....	19	22	6	1910.8	24 09.9	"	J. E. Ross.
At " " 26.....	22	22	6	1910.6	27 32.1	"	"
25.00 W.—" " 25.....	23	22	6	1910.6	26 53.8	"	"
10.78 W.—" " 34.....	84	22	6	1911.7	31 20.9	31 17.9	O. Rolfson.
54.20 W.—" " 33.....	84	22	6	1911.7	31 50.8	31 47.8	"
34.78 N.—N. E. cor. sec. 35.....	88	22	6	1911.7	31 52.8	31 53.0	J. R. Akins.
72.50 W.—" " 34.....	83	22	6	1911.7	31 50.9	31 48.1	"
1.50 W.—centre sec. 1.....	14	23	6	1910.6	25 17.0	25 22.1	R. D. McCaw.
40.25 N.—N. E. cor. sec. 26.....	15	23	6	1910.5	23 40.9	23 44.3	"
1.00 W.—" " 4.....	15	23	6	1910.6	25 21.9	"	"
20.50 N.—" " 36.....	20	23	6	1910.8	25 33.0	25 33.1	J. E. Ross.
38.90 W.—" " 31.....	84	23	6	1911.7	31 33.5	31 25.5	O. Rolfson.
38.90 W.—" " 31.....	84	23	6	1911.7	31 31.3	31 31.3	"
38.90 W.—" " 31.....	84	23	6	1911.7	31 23.6	31 22.6	"
38.90 W.—" " 31.....	84	23	6	1911.7	31 28.4	31 24.4	"
38.90 W.—" " 31.....	84	23	6	1911.7	31 42.1	31 35.1	"
34.56 W.—N. E. cor. sec. 36.....	88	23	6	1911.7	31 42.9	31 41.1	J. R. Akins.
47.80 W.—" " 35.....	88	23	6	1911.7	31 40.3	31 40.3	"
78.00 W.—" " 35.....	88	23	6	1911.7	31 42.2	31 39.2	"
14.24 W.—" " 33.....	88	23	6	1911.7	31 46.9	31 43.9	"
15.00 N.—" " 23.....	18	24	6	1910.5	25 43.6	25 45.4	R. D. McCaw.
48.78 W.—" " 36.....	84	24	6	1911.7	31 45.2	31 38.2	O. Rolfson.
48.78 W.—" " 36.....	84	24	6	1911.7	31 37.0	31 38.0	"
36.91 W.—" " 32.....	84	24	6	1911.7	31 32.8	31 31.8	"
70.36 W.—" " 35.....	88	24	6	1911.7	32 00.5	31 55.5	J. R. Akins.
64.17 W.—" " 34.....	88	24	6	1911.7	32 00.2	31 57.2	"
31.80 W.—" " 31.....	88	24	6	1911.7	32 08.9	32 05.9	"
17.18 W.—" " 36.....	88	24	6	1911.7	31 52.8	31 54.8	"
17.18 W.—" " 36.....	88	24	6	1911.7	32 04.1	31 56.1	"
40.00 N.—" " 12.....	17	25	6	1910.5	27 43.2	27 51.6	R. D. McCaw.
8.00 W.—" " 19.....	23	25	6	1910.9	26 46.2	"	T. H. Plunkett.
At N. E. cor. N. W. 1/4 sec. 26.....	23	25	6	1910.9	26 07.5	26 06.2	T. H. Plunkett.
27.61 W.—N. E. cor. sec. 36.....	84	25	6	1911.8	31 12.8	31 06.8	O. Rolfson.
27.61 W.—N. E. " 36.....	84	25	6	1911.8	31 07.0	31 07.0	"
27.61 W.—N. E. " 36.....	84	25	6	1911.8	31 09.2	31 05.2	"
71.82 W.—N. E. " 33.....	84	25	6	1911.8	31 04.2	30 53.2	"
71.82 W.—N. E. " 33.....	84	25	6	1911.8	30 56.2	30 56.2	"
9.58 N.—S. W. " 6.....	87	25	6	1911.8	31 50.9	31 45.9	L. Brenot.
44.80 N.—N. W. " 18.....	87	25	6	1911.8	32 07.8	32 03.8	"
41.00 N.—N. W. " 31.....	87	25	6	1911.8	32 05.6	"	"
23.66 W.—N. E. " 36.....	88	25	6	1911.7	32 02.3	31 59.3	J. R. Akins.
23.93 W.—N. E. " 28.....	88	25	6	1911.7	32 19.8	32 18.8	"
76.23 W.—N. E. " 29.....	88	25	6	1911.7	32 26.8	32 22.8	"
5.00 N.—N. W. " 2.....	82	26	6	1911.7	30 51.5	30 46.7	L. Brenot.
53.00 N.—N. W. " 23.....	82	26	6	1911.7	30 54.7	30 51.9	"
26.56 N.—N. W. " 24.....	83	26	6	1911.7	30 51.0	30 47.0	"
69.13 N.—N. W. " 13.....	84	26	6	1911.7	30 56.0	30 51.0	"







# THE COPYING CAMERA

OF THE

SURVEYOR GENERAL'S OFFICE

BY

E. DEVILLE, LL.D.

Surveyor General of Dominion Lands

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OTTAWA  
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# THE COPYING CAMERA

OF THE

## SURVEYOR GENERAL'S OFFICE

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### PART I.—THE CAMERA.

#### 1. General Features of Copying Cameras.

The evolution of the copying camera from the crude wooden box of the early days to the elaborate instrument now in general use is one of the many evidences of the progress of photography. Nowhere has photography proved more useful than in survey departments: apart from the printing of maps by the various processes of photo-lithography, photo-zincography and photo-engraving, the reductions, enlargements and other copies of maps and plans required by surveyors for field use or by draughtsmen for compiling other maps and plans, are now prepared by photography instead of being made by hand as formerly. The copying camera is accordingly an important adjunct of every survey office.

The land surveys of the Canadian Government now extend over some seven thousand townships, and the number is increasing every year. A plan of each township is printed for the administration and for the public. Every time further surveys are made in a township, and this happens frequently, a new plan has to be printed. The necessity of providing, without too great an increase in the photographic staff and equipment, for the publication of such a large number of township plans, and of the other maps and plans issued by the Survey Department, has developed a copying camera presenting some peculiar features, a description of which may prove of interest.

One of the first improvements in copying cameras was in the mode of suspension. It was found that the vibrations caused by the machinery always present in business buildings, or even by the street traffic, affected the sharpness of the negative; although the vibrations did not mar the appearance of a portrait, the quality of a line negative was seriously impaired. The vibrations were prevented at first by placing the camera and the board upon a cradle suspended by ropes from the ceiling. The board was fixed at one end and the camera moved to and fro upon rails on the cradle. The rope suspension is still in use, but is somewhat inconvenient; a better combination is to support the cradle by means of springs upon a stand, and this is the mode of suspension most frequently met with. So long as the camera is small, this suspension is convenient; the work of the process worker being, as a rule, of small size, this style fulfils his requirements. For the reproduction of maps, however, the conditions are different, because maps are frequently of large size. A large camera, with a board in proportion, and a spring cradle on a stand, would be



very unwieldy indeed, and most inconvenient in use. Such a combination is seldom found in survey departments, the trouble from vibrations being usually overcome by setting up the camera in a place far away from traffic and machinery. No such place was available here; the photographic office was on the top floor of a building in which lithographic presses were running, and some mode of spring suspension was imperative.

The solution adopted consists in suspending the cradle by springs from the ceiling, but instead of putting the camera and board on the cradle, they are placed underneath.

## 2. Camera of the Surveyor General's Office.

The board is fixed at one end of the cradle: the lens and plate are on two separate carriages sliding on two pairs of V rails. The rails for the plate carriage

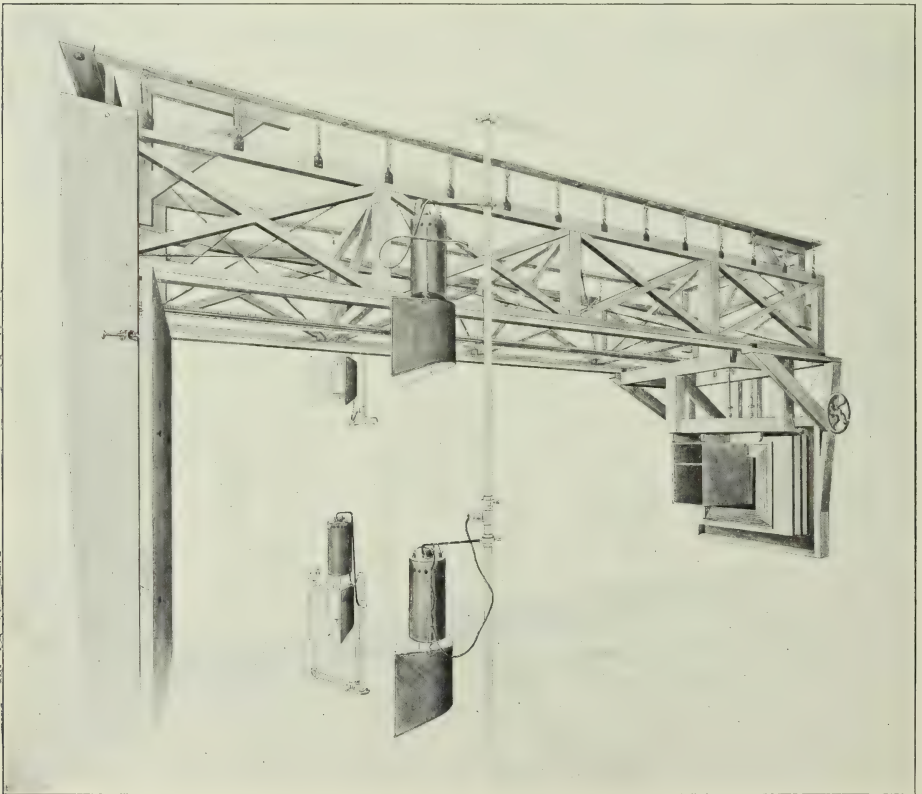


FIG. 1—Camera fitted with short bellows for great reduction.

are outside the cradle, those for the lens carriage are inside. The lens can be brought within ten inches of the plate (Fig. 1). Bellows suspended by chains from runners under the cradle can be inserted to give any camera extension needed



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for enlarging (Fig. 2). Negatives for the offset lithographic press and for photographic printing are made with the camera so fitted. For half-tone and line engraving, and for printing from stones, the lens hood of the lens carriage is removed and a reverse camera substituted (Fig. 3).

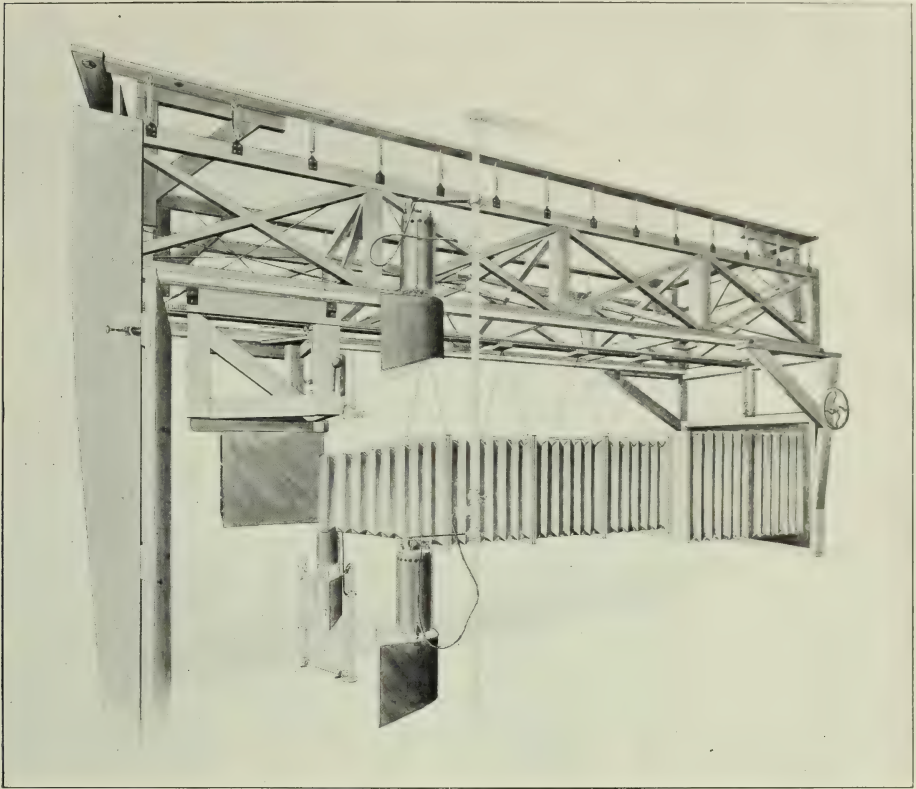


FIG. 2—Camera fitted with long bellows for enlarging.

The cradle is fourteen feet long and four feet wide. The first cradle of this pattern, although very strong, was subject to torsional vibrations; it was replaced by the present cradle, which is wider, deeper and strongly braced by iron rods with turnbuckles. Absolute rigidity of the cradle is essential.

The swing of the whole apparatus, if suspended freely, would be inconvenient. It is limited by wooden arms bolted to the ceiling at both ends and extending inside of the cradle. Pieces of soft rubber, half an inch thick, are inserted between the arms and the cradle, thus limiting the swing without transmitting vibrations.

### 3. The Board.

Two uprights fixed at one extremity of the cradle are terminated at their lower ends by iron brackets upon which the weight of the board rests; it is attached to the



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uprights by four adjusting screws. The surface of the board is tested with a straight edge; if warped, it can be straightened by means of crossbars and bolts acting upon the cleats. About eighty per cent of the originals are of one particular size (township plans); these are placed on the board behind a glass plate held at the four corners by bolts and nuts. The original is adjusted to correct position, after which

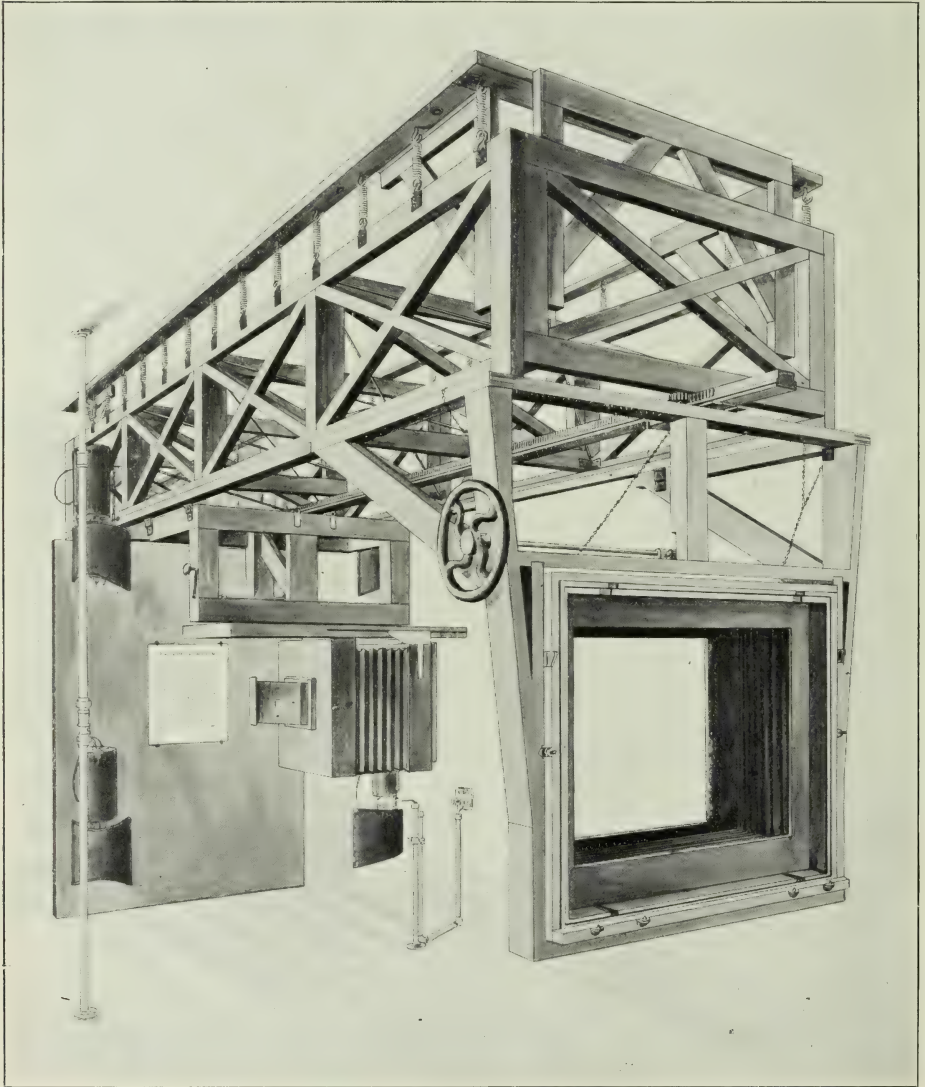


FIG. 3—Reverse Camera.

the nuts are tightened. The insertion of the glass plate shortens the optical distance from the lens by one-third the thickness of the plate; the board has to be moved that much farther away. Originals of other sizes are pinned to the board, the glass and bolts being removed.



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Through the centre of the board two lines are drawn at right angles, approximately horizontal and vertical. Likewise the two middle lines, in the direction of the width and in the direction of the height, of the original to be reproduced, are indicated by short lines drawn on the border of the original. The latter is in correct position when its middle lines coincide with the lines of the board.

At the centre of the board is a hole through which a microscope or the telescope of an optical square can be inserted for adjusting the camera; it is closed by a plug when not in use.

#### 4. The Lens Carriage.

The lens carriage slides on two pairs of steel shoes far enough apart to prevent wobbling; the motion is given by a rack and pinion through angle gear and a crank at the side of the carriage.

The lens board fits in a rebate at the bottom of a deep hood, the object of which is to keep stray light off the interior of the camera.

The bellows fit in another rebate at the back of the hood, where they are held by two turnbuttons. A lens of 33.7 inches focus is used for most of the work; for great reductions and for the reverse camera, a lens of shorter focus is employed.

The graduations for setting the carriages in position are on an enamelled hardwood rod, 1×3 inches, attached to the middle of the cradle, the pointers being fastened to the carriages. The lens carriage has two pointers, one for the direct camera and one for the reverse camera. Both pointers are adjustable, and can be clamped by screws when in correct position.

#### 5. The Plate Carriage.

Sections of bellows of convenient size can be fitted up between the two carriages, providing camera extensions from 10 inches to 11 feet. They are fastened to each

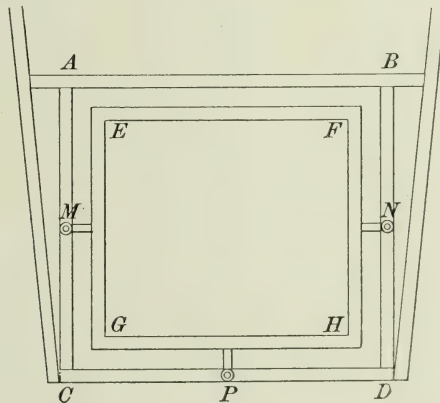


FIG. 4--Frame of Plate Carriage.

other by hooks and are supported by chains hanging from runners under the cradle. The plate carriage, like the other one, has two pairs of steel runners; they slide



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upon the outside V rails, the motion being given through a rack and pinion and angle gear by a large hand wheel.

The plate carriage consists of a rectangular frame, *A B C D* (Fig. 4), inside of which is another frame, *E F G H*, to which the plate-holder is attached. The inner frame is connected to the outer one by three trunnions, *M*, *N* and *P*. Each trunnion is on a steel plate which slides forwards and backwards in a steel groove by means of an adjusting screw. By turning the screw at *P*, the inner frame revolves around *M N* as an axis. By turning the screws at *M* and *N* in opposite directions, the inner frame revolves around the vertical through *P* as an axis. For moving the inner frame bodily forwards or backwards, parallel to itself, the three screws are turned in the same direction.

The four plate-holders are 24"  $\times$  32", 20"  $\times$  24", 16"  $\times$  18" and 10"  $\times$  12", respectively; they can all be attached to the inner frame in accurate register. The larger one, which is somewhat heavy, is moved about on a truck, with rubber tire wheels

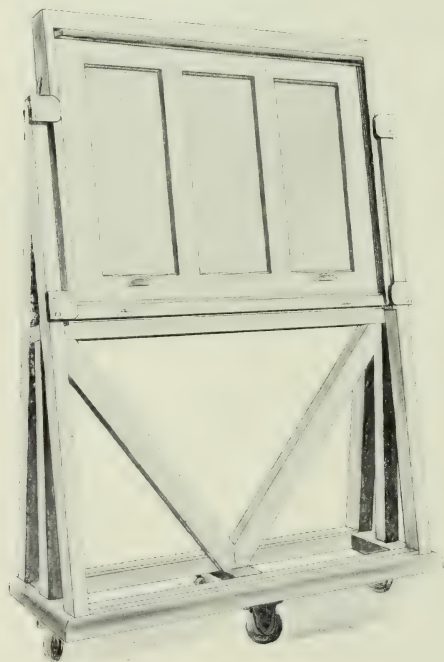


FIG. 5--Plate-holder Truck.

(Fig. 5), to which it is fastened by two turnbuttons and from which it is removed only for attaching to the camera. It remains on the truck in the dark room. When brought close to the plate carriage, a lift of a few inches brings it to its place on the camera.

The smaller holders are more easily handled; the operator always gives the preference to the smallest holder that will take in his plate.

Plates up to 20"  $\times$  24" are sensitized in a glass bath enclosed in a wooden case a little more than twice the height of the bath and inclined about ten degrees to



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the vertical. The upper half of the case is closed by a sliding panel supported by a counterweight so adjusted that the panel stays either open or closed. Another counterweight heavier than the 20"  $\times$  24" plates, supports by means of a rope and pulley the dipper upon which the plate is placed for sensitizing. After coating the plate with collodion and putting it on the dipper, the panel is closed and the counterweight of the dipper is slowly lifted by hand from the lower shelf upon which it was resting, allowing the plate to descend into the bath, and is deposited upon an upper shelf when the plate is completely immersed. The plate is left four minutes in the bath and then the counterweight is taken from the upper shelf and slowly brought down to the lower shelf, withdrawing the plate from the solution and leaving the bottom of the plate upon the edge of the glass bath. The plate is allowed to drip for one or two minutes, the panel is opened and the plate transferred to the plate-holder. Up to the transfer of the plate to the plate-holder, the whole operation is performed in full daylight.

## 6. Reverse Camera.

The reverse camera, 18"  $\times$  20", is used with the smaller lens; the extension is 24 inches. The front is fixed, focussing being effected by moving the back by means of a double rack, pinion and crank. A graduated brass scale on the bed indicates the reduction.

The silvered glass reversing mirror fits snugly into the groove of a rectangular board connected to the mirror box by four adjusting screws, *A*, *B*, *C* and *D* (Fig. 6). By turning the screws *A* and *B* in opposite directions, the mirror revolves around a vertical axis through its centre. Likewise by turning the screws *C* and *D* in opposite

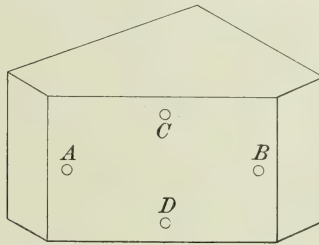


FIG. 6—Mirror Box.

directions, the mirror revolves around the horizontal line in its plane through its centre.

The equipment comprises two mirrors, one being in use while the other one is out for silvering. With proper care and provided it is slightly warmed before any attempt is made to polish it, the silvering is good for six months or more. Incidentally it may be mentioned that an optically plane mirror is an expensive article; many of those found in the trade are imperfect and spoil the definition of a good lens.

A feature of this style of copying camera is its adaptability to large sizes. A large plate holder, a few extra lengths of large bellows and a larger lens are all that



is needed. So far as the camera is concerned, the large plates are handled without any more trouble than the smaller ones. The size of the plate here has been limited to  $24'' \times 32''$ , merely because there is no occasion to use a larger plate.

### 7. Setting the Camera.

Two methods are available for setting a copying camera. By the first method the camera is adjusted at each operation so as to yield an image of a definite size and shape, which may or may not be an accurate reduction of the original. By the second method, the camera is adjusted once for all beforehand so as to yield in all cases an accurate reduction or enlargement of the original.

The first method is in general use and has some advantages. Let it be assumed, for instance, that a map has to be reduced to a rectangle  $24'' \times 30''$ . The operator rules on the ground glass a rectangle of that size, and endeavours in the usual manner to obtain an image filling approximately the rectangle so drawn. The next step is to bring one side of the image in coincidence with the corresponding side of the rectangle; this is done either by turning the board around an axis perpendicular to its face and by shifting it right or left and up or down, or by like motions of the camera. It is now found that the other sides of the rectangle do not fit, the shape of the image being an irregular quadrilateral; it has to be brought to correct shape by changing the inclination of the board to the axis of the camera. Every time an adjustment is made, it disturbs the preceding ones, which have all to be gone over again. To one without experience, the process is exceedingly tedious; like everything else, however, it is made easier by long practice, and some operators become in time very skilful. The main advantage of the method lies in the fact that, in some cases, it is possible to restore to correct proportions a drawing which has become distorted. Some kinds of paper, and especially tracing cloth, are affected by atmospheric conditions, and distortion occasionally becomes appreciable.

The advantage of the second method lies in its rapidity. The operator pins the original to the board, sets the two carriages by the scale to the reduction or enlargement marked on the job slip and exposes the plate. There is no focussing or twisting of the camera or board; in fact, no ground glass is used. This method was adopted by the office of the Surveyor General because the number of land survey plans to be reproduced is very great, and because the angles and lengths being marked in figures on the plans, scaling is unnecessary and a slight distortion would be immaterial. Moreover in an original properly cared for, distortion is seldom appreciable, and the most frequent case of distortion, that which is due to unequal expansion in the direction of and across the web of the paper, cannot be corrected by the adjustment of the camera.

### 8. Focussing.

Focussing is done with Carl Zeiss microscope (Fig. 7). This microscope, which has a power of 28 diameters, slides in an outer split sleeve terminated by a square base which can be applied against a glass plate. The coarse adjustment is effected by sliding the microscope in the outer sleeve till a distinct image is seen, and fastening it in that position by turning the milled screw ring at the top of the outer sleeve.



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The fine adjustment is effected by screwing the body of the microscope in or out of an inner split sleeve, the second clamping ring (shown on the left of the 10 mm. division of the scale) having been released. The displacement of the microscope is read on the millimetre scale, the tenths of a millimetre being indicated by marks on the circumference of the inner sleeve and the hundredths easily estimated.

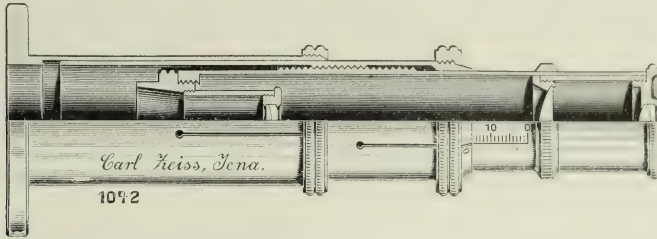


FIG. 7—Focussing Microscope.

For focussing the camera, a large piece of clear plate glass, perfectly plane, is selected, and a cross of two very fine lines is engraved in the centre with a diamond. The plate is inserted in the plate holder, engraved face towards the board, after removing the curtain and back of the holder. The base of the microscope is now applied against the back of the plate, it is set upon the engraved cross and the millimetre scale is read. The microscope is put against the plate again and is set this time upon the image of the original pinned to the board. The millimetre scale is read a second time. The difference of the two readings is the distance between the face of the glass plate and the plane of the image.

For instance, readings of 9.6 mm. on the engraved cross and 8.3 mm. on the image indicate that the image is 1.3 mm. in front of the plate, or in other words, that the plate carriage has to be moved 1.3 mm. forward in order to be in exact focus. Readings of 9.6 mm. on the engraved cross and 12.6 mm. on the image indicate that the image is 3 mm. behind the face of the glass and that the plate carriage must be moved 3 mm. backward.

### 9. Definitions.

The *axis of the camera* is a line through the optical centre of the lens parallel to the direction of motion, that is to say parallel to the rails. It must coincide with the optical axis of the lens; the flange of the latter must be so affixed to the camera that this condition is approximately fulfilled, otherwise the definition is impaired away from the centre of the plate.

The *centre of the board* is the point where the axis of the camera strikes the face of the board; it may be some distance from the geometrical centre.

The *centre of the plate* is the point where the axis of the camera strikes the face of the plate.

The image of the centre of the board always falls upon the same point of the plate (the centre of the plate). These two points are the only ones endowed with this reciprocal relation.



The *reduction*,  $n$ , is the proportion of the lines of the original to the corresponding lines of the image.

The *enlargement*, also designated by  $n$ , is the proportion of the lines of the image to the corresponding lines of the original.

According to these definitions, a reduction of 3.00 means that the linear dimensions of the original are three times the dimensions of the image. An enlargement of 3.00 means that the linear dimensions of the image are three times the dimensions of the original. Reductions and enlargements are never less than unity.

### 10. Geometry of the Copying Camera.

*Relations between conjugate foci.*—Let  $A$ , Fig. 8, be the lens in position for reducing,  $u$  and  $v$  being the distances to the board and to the plate respectively. The reduction is:—

$$n = \frac{u}{v}$$

The values of  $u$  and  $v$  are:—

$$u = (1 + n) f \quad (1)$$

$$v = \left(1 + \frac{1}{n}\right) f \quad (2)$$

$f$  being the focal length of the lens.



FIG. 8.

Moving the lens to  $B$  for enlarging, the relations become:—

$$n = \frac{v'}{u'}$$

$$u' = \left(1 + \frac{1}{n}\right) f \quad (3)$$

$$v' = (1 + n) f \quad (4)$$

The various distances are accordingly as follows:—

	For reducing.	For enlarging.
Board to Lens	$(1 + n) f$	$\left(1 + \frac{1}{n}\right) f$
Lens to Plate	$\left(1 + \frac{1}{n}\right) f$	$(1 + n) f$
Board to Plate*	$\left(2 + n + \frac{1}{n}\right) f \quad (5)$	

\* 'Board to Lens' is in reality the distance to the first nodal point; 'Lens to Plate' is from the second nodal point. For 'Board to Plate', it would be necessary to add the distance between the nodal points, but this distance being eliminated in the application of these values made here, reference to the nodal points has, for the sake of simplicity, been omitted.



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*Differential motions.*—If, the lens being at *A*, Fig. 9, for reducing the board is

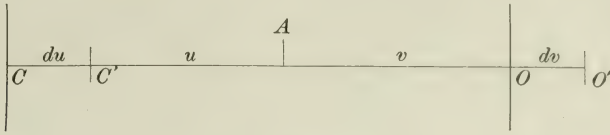


FIG. 9.

slightly displaced from *C* to *C'*, the image which at first formed in *O* will now be in *O'*. The relation between the displacement of the board, *du*, and of the plate, *dv*, obtained by differentiating (1) and (2), is:—

$$du = -n^2 dv \quad (6)$$

For an enlargement the relation is inverted:—

$$du' = -\frac{dv'}{n^2} \quad (7)$$

Thus for a reduction of 3.00, the displacement of the plate is one-ninth of the displacement of the board, while for an enlargement of 3.00, the displacement of the plate is nine times the displacement of the board.

*Changes of scale.*—When a map on a scale of *a* miles to one inch is reduced *n*, the scale of the copy is *na* miles to one inch. To reduce a map on a scale of *a* miles to one inch to *b* miles to one inch, the reduction must be  $\frac{b}{a}$ . Likewise, when a map on a decimal scale  $\frac{1}{a}$  is reduced *n*, the scale of the copy is  $\frac{1}{na}$ . To reduce a map on a decimal scale  $\frac{1}{a}$  to the scale  $\frac{1}{b}$ , the reduction must be  $\frac{b}{a}$ .

An enlargement *n* of a map on a scale of *a* miles to one inch produces a copy on a scale of  $\frac{a}{n}$  miles to one inch. To enlarge the map from the scale of *a* miles to one inch to the scale of *b* miles to one inch, the enlargement must be  $\frac{a}{b}$ .

Likewise, when a map on a decimal scale  $\frac{1}{a}$  is enlarged *n*, the copy is on the scale  $\frac{n}{a}$ . To enlarge the map from the scale  $\frac{1}{a}$  to the scale  $\frac{1}{b}$ , the enlargement must be  $\frac{a}{b}$ .

When a map on a scale of *a* miles to one inch is reduced *n'* and the copy is subsequently enlarged *n''*, the final scale is  $\frac{n'a}{n''}$  miles to one inch. A map on a scale of *a* miles to one inch will be changed to a scale of *b* miles to one inch by reducing it *n'* and enlarging the copy *n''* provided:

$$\frac{n'}{n''} = \frac{b}{a}$$



When the copy desired is larger than the plate it is proposed to work with, the change of scale may be made in two different ways. A number of negatives sufficient to cover the whole map can be made on the desired scale; these are printed by contact and the prints are joined together to form the copy. The other way is to make a reduced negative of the whole map, to put the negative in the enlarging camera and to enlarge it to the requisite scale on a single piece of bromide paper. The first method gives a sharper result; the second method saves work and has the advantage of producing a copy on a single sheet of paper.

As an illustration, suppose a map  $42'' \times 54''$  on a scale of 10 miles to one inch has to be reduced to 12 miles to one inch and the plate it is proposed to employ is  $10'' \times 12''$ . The reduction is:

$$n = \frac{12}{10} = 1.20$$

The reduced map will be  $35'' \times 45''$ . Setting the copying camera at a reduction of 1.20, it takes fifteen or sixteen negatives  $10'' \times 12''$  to cover the map. The negatives are printed by contact and the fifteen or sixteen pieces are joined together to make the finished copy.

Sharpness of the lines may not be essential, or it may be desired to save work or to have the finished copy in one piece. Should this be the case, one negative of the whole map is made to be enlarged subsequently. The ratio of the short sides of the map and plate is  $\frac{42}{10}$  or 4.20, the ratio of the long sides  $\frac{54}{12}$  or 4.50; therefore the reduction  $n'$  must be at least 4.50 for covering the whole map with one negative. Make the negative with  $n' = 5.00$  so as to leave a little margin on the plate. An enlargement  $n''$  has now to be made from this negative. The relation quoted above between  $n'$ ,  $n''$  and the scales gives:

$$n'' = n' \times \frac{a}{b}$$

In this case:

$$n'' = 5.00 \times \frac{10}{12} = 4.167$$

Therefore the map has first to be reduced 5.00 and then enlarged 4.167.

### 11. Adjustments of the Camera.

A good anastigmat, if used at a moderate angle, gives an image practically free from distortion, provided the board and plate are parallel and the optical axis of the lens is perpendicular to both. The last condition is sufficiently well fulfilled in a camera carefully constructed but it will not be amiss to check it. The first condition must be accurately fulfilled, means of adjustment being provided for that purpose.

Before proceeding with the adjustment, it is necessary to check, and to correct if needed, some of the details of construction.

The rails must be perfectly straight and parallel. This is checked by stretching a thread from one end of each rail to the other end, first with the cradle lying flat



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down and next with the cradle lying on its side. Parallelism is checked by measuring the spacing of the rails.

The board must be perfectly flat. This is checked with a steel straight edge applied on edge against the face of the board at different places and in different directions. The board is straightened by means of the screws at the back until perfectly straight in all directions.

The plates in all the plate holders must register alike. For checking this, the largest holder with the selected glass plate is attached to the camera and the bellows are removed. Two wooden rods with straight edges are clamped to the frame of the plate carriage in front of the plate holder, one of the rods being opposite the top of the plate, the other rod opposite the bottom. Each rod is adjusted so as to be parallel to the plate, the space between the plate and the edge of the rods being carefully measured. Another plate-holder with a selected glass plate is now substituted, and the space between the edge of the rods and the four corners of the plate measured. The plate-holder or its fittings must be altered until this space is exactly the same as for the large plate-holder. The other plate-holders are successively fitted in accurate register by the same process.

## 12. The Centre of the Board.

The first adjustment of the camera is to find the centre of the board.

Shift the plate carriage to the end of the cradle as far as it will go, attach the plate-holder after inserting the engraved glass plate and removing the curtain and back. Pin to the board, approximately in the centre, the millimetre scale shown in Fig. 10. The lens carriage is now shifted and brought by means of the focussing

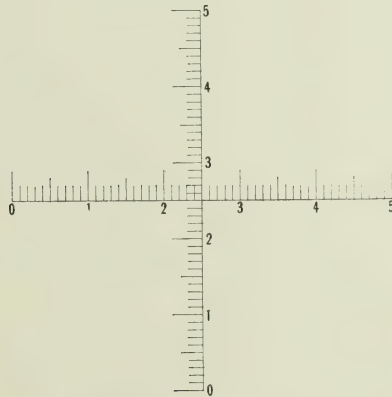


FIG. 10—Millimetre scale.

microscope to focus the image of the millimetre scale upon the face of the plate. This image will fall upon the cross engraved on the plate if the points selected as centres of the board and plate are not too far out. The vertical line of the plate will lie across the horizontal arm of the scale, and the horizontal line of the plate will lie



across the vertical arm of the scale. The readings of the scale at the two crossings are noted.

The lens carriage is then shifted towards the board till the image is in focus again, and the readings of the scale are noted as before.

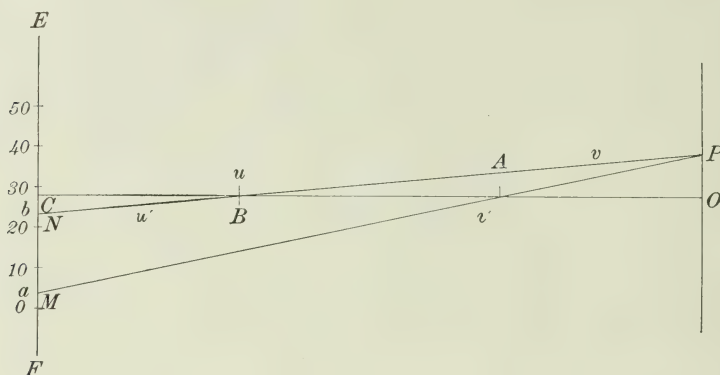


FIG. 11.

Let Fig. 11 represent a vertical section through the axis  $OC$  of the camera,  $EF$  being the board,  $OP$  the plate,  $A$  and  $B$  the first and second positions of the lens,  $P$  the horizontal line of the engraved cross,  $N$  and  $M$  the two divisions of the millimetre scale whose image falls upon  $P$ , and  $a$  and  $b$  the corresponding readings of the scale.

It will be noted that in this case  $u = v'$  and  $v = u'$ ; that is to say, the reduction and enlargement are equal:

$$n = \frac{u}{v} = \frac{v'}{u'}$$

In reducing,  $PO$  is the image of  $MC$ ; hence:

$$PO = \frac{MC}{n}$$

In enlarging,  $PO$  is the image of  $NC$ ; hence:

$$PO = n \times NC$$

Combining the two equations:

$$n^2 \times NC = MC$$

and:

$$NC = \frac{MN}{n^2 - 1}$$

But:

$$MN = b - a$$

and:

$$NC = \frac{b - a}{n^2 - 1}$$



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The reading of the scale where it is intersected by the horizontal line passing through the centre of the board is accordingly:

$$b + \frac{b-a}{n^2-1}$$

Through this division of the scale, a horizontal line is drawn on the board.

The same procedure is followed for the horizontal branch of the millimetre scale and a vertical drawn through the proper division of the scale. The intersection of the horizontal and vertical lines so drawn is the centre of the board.

Through the centre of the board two lines at right angles, approximately horizontal and vertical, are drawn right across the board. Their images must be as nearly as possible parallel to the sides of the plate.

The extension of the reverse camera being comparatively short, the limit of  $n$  for enlarging is small. With small values of  $n$ , the term  $\frac{b-a}{n^2-1}$  in the expression for the reading of the scale becomes inaccurate. Instead of setting the reverse camera at equal reduction and enlargement, it is preferable to set it first at the greatest reduction,  $n$ , and then at the greatest enlargement,  $n'$ , the extension admits of. Keeping the same notation as before, it is easily found that the reading of the scale for the centre of the board is:

$$b + \frac{b-a}{nn'-1}$$

### 13. The Centre of the Plate.

The centre of the plate is the point upon which falls the image of the centre of the board. If the camera has been accurately constructed, this point is very close to the cross engraved on the plate. For convenience in registering lithographic transfers, it is necessary that the optical and geometrical centres of the plate should nearly coincide; the discrepancy, if any, must be removed by altering the plate-holder or its fittings. For the same reason, the images of the two lines drawn across the board must be parallel to the sides of the plate; care is taken to fulfil this condition in drawing the lines.

### 14. Adjustment of the Board and Plate-holder Frame.

The board and plate must both be accurately perpendicular to the axis of the camera.

The adjustment is effected by means of the optical square shown in Fig. 12. It consists of a telescope attached to two brass plates between which wooden arms are bolted. At the end of each arm is a small adjusting screw. The diaphragm of the telescope bears two threads at right angles, one of them being parallel to the wooden arms. Several pairs of wooden arms of different lengths are provided; the pair used for the board has the adjusting screws at the back instead of in front. The normal plane of the optical square is indicated by lines drawn on the two brass plates and by notches on the cell of the objective.



For adjusting the optical square, the plate carriage is moved to the extreme end of the cradle, the lens and front board are removed from the lens carriage and the millimetre scale shown in Fig. 10 is pinned to the centre of the board.

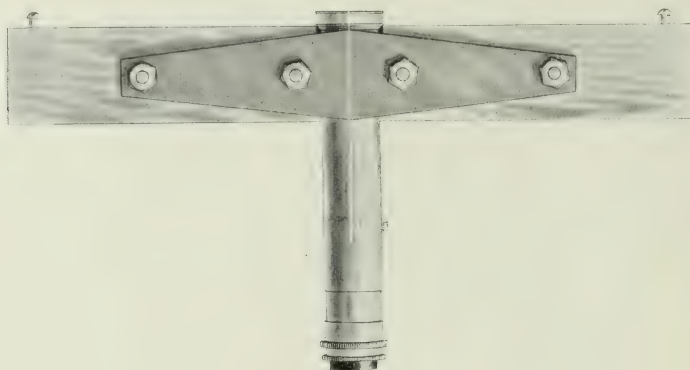


FIG. 12—Optical Square.

Let  $AB$ , Fig. 13, be the plate,  $DE$  the board,  $O$  the centre of the plate,  $C$  the centre of the board. Having focussed the telescope, apply the optical square against the plate, arms horizontal, screws  $G$  and  $H$  resting against the glass and the notch of the objective cell on the vertical line  $O$  of the central engraved cross. The line is too fine to be seen with the naked eye and must be indicated by a small piece of

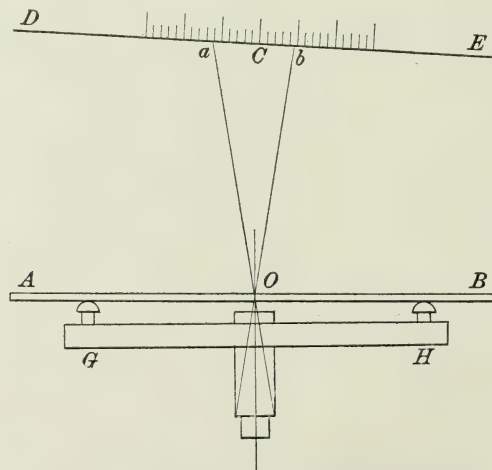


FIG. 13—Adjustment of the Optical Square

paper pasted to the glass. Looking through the telescope, the vertical thread is seen to cross the horizontal arm of the scale and the reading,  $a$ , is noted. The optical square is now reversed end for end. If the same reading,  $a$ , of the scale is obtained, the optical square is in adjustment. If not, the second reading,  $b$ , is noted, and one



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of the screws *G* or *H* at the end of the wooden arms is screwed or unscrewed until the reading on the scale becomes:

$$\frac{a+b}{2}$$

The adjustment of the plate-holder frame is now proceeded with. Applying the optical square against the plate *AB*, Fig. 14, arms horizontal, in the same position as before, the screws *S* and *T*, which command the slides of the trunnions, are turned in opposite directions till the vertical thread of the telescope is seen to pass through the centre *C* of the board.

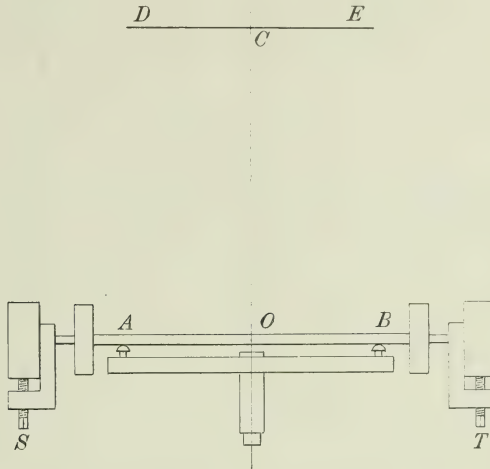


FIG. 14—Adjustment of the Plate-holder Frame.

The optical square is next fixed against the plate, wooden arms vertical, the notch of the objective cell being held on the horizontal line of the engraved cross.

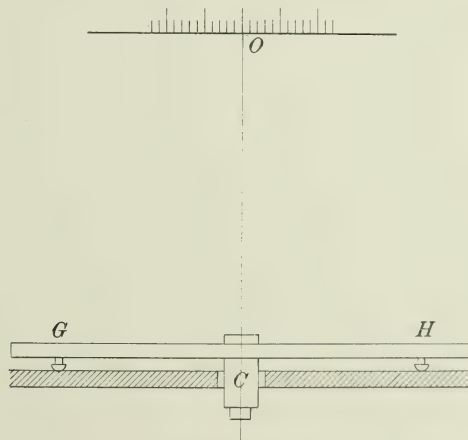


FIG. 15—Adjustment of the Board.

The bottom slide is screwed in or out until the horizontal thread of the telescope is seen to pass through the centre of the board.



The board is adjusted by the same method. The millimetre scale is stuck to the centre of the plate at *O*, Fig. 15, the plug in the centre of the board, *C*, is removed and the telescope of the optical square is inserted through the opening, arms horizontal, the line of the normal plane drawn on the instrument being brought in coincidence with the vertical line of the board. The optical square is adjusted in the manner already described by screwing in or out one of the screws, *G* or *H*. With the arms of the optical square horizontal, the board is revolved by turning in opposite directions its adjusting screws on the right and on the left until the vertical thread of the telescope is on the centre of the plate. With arms vertical, the board is revolved by turning in opposite directions its top and bottom adjusting screws, until the horizontal thread of the telescope is on the centre of the plate. Care must be taken to turn the screws evenly, otherwise the face of the board would be bent.

### 15. Graduations.

There is a double graduation for each lens, one side being for setting the lens carriage, and the other side for the plate carriage.

The graduation is calculated as follows: Let *DE*, Fig. 16, be the board, *FG* the plate at the far end of the cradle, *CO* the axis of the camera, *A* and *B* the two positions of the lens for which the image is in focus on the plate, *CB* being equal to *AO*. The focal length found by subtracting (2) from (1) is:

$$f = \frac{AB}{n - \frac{1}{n}} \quad (8)$$

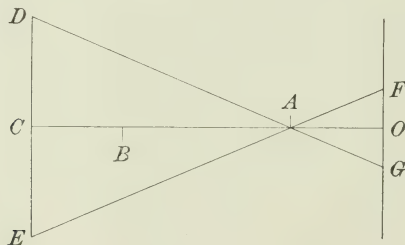


FIG. 16.

*AB* is the displacement of the lens carriage. It is measured on the rod attached under the cradle, the two positions being marked upon it. For focussing, the microscope is set on the plate at *O*, the tube is turned until the cross lines engraved on the plate are in focus and the reading of the microscope scale is noted. By repeating the operation several times the focus is accurately ascertained. Replacing the microscope on the plate, the tube is turned till the image of the board is perfectly sharp and distinct and the reading of the microscope scale is noted. This also is repeated several times. The difference of the two readings is approximately the distance the lens carriage has to be moved to bring the image of the board on the face of the plate. After moving the lens carriage, the focussing is repeated until an exact focus is obtained.



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The reduction,  $n$ , is found by measuring  $DE$  and  $FG$ .

Through the centre of the plate,  $O$ , Fig. 17, draw a parallel  $MN$  to the long sides of the plate; at equal distances from the centre and near the edge, erect perpendiculars in  $M$  and  $N$ . The crosses at the two ends of this line must be drawn with a diamond on the plate. In drawing these lines as well as the cross at the centre, the diamond must be held at the proper angle and a very light pressure exerted, hardly more than the weight of the diamond, otherwise the lines will be ragged and accurate measurements impossible. Rubbing a pencil across the lines helps to make them visible.

Upon the board, two points,  $A$  and  $B$ , are marked on the horizontal line at equal distances from the centre,  $C$ , and such that their images will fall very nearly upon the points  $M$  and  $N$  of the plate. At these points erect perpendiculars to the hori-

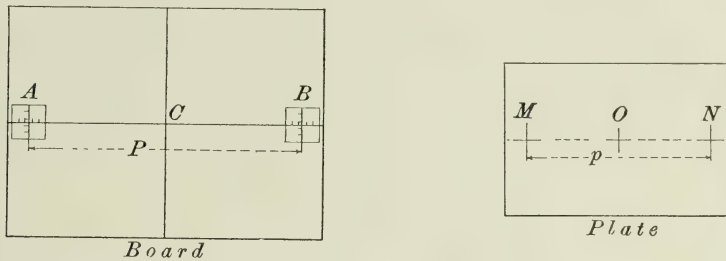


FIG. 17.

zontal line and upon the crosses so formed pin two of the millimetre scales shown in Fig. 10. Measure carefully the distances  $p$  between  $M$  and  $N$ , and  $P$  between  $A$  and  $B$ . Looking now at the plate the vertical line  $N$  will be seen to cross the horizontal arm of the scale  $A$ , and the vertical at  $M$  the horizontal scale  $B$ . Let  $a$  and  $b$  be the readings of the two scales; then the reduction is:

$$n = \frac{P + b - a}{p}$$

This value of  $n$  used in (8) gives the focal length.

It is somewhat difficult to focus accurately an enlarged image; it is, therefore, preferable to determine the position of the lens carriage at  $B$ , Fig. 16, by focussing from the board side. This is done by inserting the microscope through the centre hole of the board and resting the base against the face of the board. The reading of the microscope scale for the face of the board is ascertained by focussing a scratch on the back of a glass plate and adding the thickness of the base of the microscope.

The graduation for the plate carriage is obtained by calculating the distance board to plate for the various degrees of reduction or enlargement; this distance, given by (5), is:

$$\left(2 + n + \frac{1}{n}\right)J$$

For the lens carriage, the distance board to lens for a reduction is given by (1) as:

$$(1 + n$$



For an enlargement, it is given by (3) as:

$$\left(1 + \frac{1}{n}\right) f$$

A table of the values of  $2 + n + \frac{1}{n}$  and  $1 + \frac{1}{n}$  is given in Part III; it is unnecessary to give a table of  $1 + n$ , as it would merely be one of consecutive numbers.

The numbers of these tables have to be multiplied by  $f$ ; this is quickly done with an arithmometer.

For drawing the graduation on the rod, the two reference marks at  $A$  and  $B$ , Fig. 16, are used as starting-points. The divisions are marked for every 0.01 of  $n$ ; they are located by dividing into equal parts the spaces between the values of the table. The figures for the lens carriage are made black and those for the plate carriage red.

Instead of the above graduations, a single scale of equal parts, a millimetre scale for instance, might be attached to the rod and the setting of the carriages done by means of the calculated tables. This would save drawing the graduation, the setting would be somewhat more accurate and it would have other advantages.

### 16. Readjusting the Focus.

The board, the plate holder frame, the graduation or the pointers may, for some reason or other, become displaced. Should this happen, the image of the board will no longer form on the face of the plate when the lens and plate carriage are set on corresponding divisions of the graduation. In order to ascertain how much the board and plate-holder frame have to be moved to bring them back to correct position, the camera is set for a reduction of  $n$ , the lens carriage being at  $A$ , Fig. 18, the plate at  $O$  and the board at  $C$ . Let  $F$  be the position of the image of the board: with



FIG. 18.

the focussing microscope measure the interval  $OF = a$  between the plate and the image. Next move the lens carriage to  $B$  for an enlargement of  $n$ , and with the focussing microscope measure the interval  $CE = b$  between the board and the image  $E$  of the plate. Let  $D$  and  $G$  be the correct positions of the board and plate respectively,  $y$  and  $x$  being the changes required to bring them to their correct places. In other words, if the board be moved from  $C$  to  $D$ , its image will move from  $F$  to  $G$ ; and if the plate be moved from  $O$  to  $G$ , its image will move from  $E$  to  $D$ . But the relation between these displacements is given by (6). It is:

$$\begin{aligned} CD &= n^2 \times FG \\ OG &= n^2 \times DE \end{aligned}$$

or:

$$\begin{aligned} y &= n^2 (a - x) \\ x &= n^2 (b - y) \end{aligned}$$



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The values of  $y$  and  $x$  derived from these equations are:

$$y = \frac{1}{1 - \frac{1}{n^4}} \left( b - \frac{a}{n^2} \right)$$

$$x = \frac{1}{1 - \frac{1}{n^4}} \left( a - \frac{b}{n^2} \right)$$

The tests are made for several values of  $n$ , the mean  $y$  and  $x$  being applied as corrections with the adjusting screws of the board and plate-holder frame. The correction can also be made by changing the position of the pointers, the lens carriage pointer being moved over an interval equal to  $y$  and the plate carriage pointer  $x + y$ .

It will be observed that the formula breaks down for  $n = 1$ , when the lens is midway between the plate and the board. The reason is because the lens, when near that position, can be moved forward or backward a small distance without changing the focus. It follows that the tests are best made with high values of  $n$ .

The factor

$$\frac{1}{1 - \frac{1}{n^4}}$$

is given below for different values of  $n$  up to 3.00. Above 3.00 the factor is unity.

$n$	$\frac{1}{1 - \frac{1}{n^4}}$	$n$	$\frac{1}{1 - \frac{1}{n^4}}$
1.20	1.93	1.80	1.10
1.30	1.54	1.90	1.08
1.40	1.35	2.00	1.07
1.50	1.25	2.25	1.04
1.60	1.18	2.50	1.03
1.70	1.14	3.00	1.01

Another method of readjusting a camera which has become disarranged is to focus it accurately and to measure the reduction as has already been explained. The pointers of the lens and plate carriages can then be moved to the divisions of the graduation representing the reduction found. This method is not as good as the other one.

### 17. Adjustment and Graduation of the Reverse Camera.

A new centre of the board has to be determined for the reverse camera; it may not be the same as for the direct camera. The determination is made in the manner already described for the direct camera.

The board being normal to the axis of the camera, requires no further adjustment. What remains to be done is to adjust the plate holder, or rather the mirror.



to set and clamp at the right place the reverse camera pointer of the lens carriage and to draw the graduation on the bed of the reverse camera.

The axis of the camera is reflected at right angles, or thereabouts, by the mirror; the condition that there shall be no distortion of the image requires that the plate be accurately perpendicular to the reflected axis. Evidently the adjustment could be made with the optical square by swinging the frame to which the plate-holder is attached, precisely as was done with the direct camera. It is preferable, however, instead of moving the plate-holder frame, to swing the mirror until the reflected axis is normal to the plate. Preference is given to the adjustment of the mirror because, being put in and taken out frequently, its position is liable to be disturbed, and because its readjustment, once its correct position has been determined, is very simple and quickly made.

The reflected axis must also be parallel, approximately at least, to the direction of motion of the plate, otherwise the centre of the plate will cease to be invariable and will change with the reduction or enlargement. Should the discrepancy be so large as to become troublesome, the fittings of the plate holder would have to be altered so as to make the plate normal to the direction of motion.

The first adjustment of the mirror can be made as follows:—

Draw a square on the plate, leaving a margin of an inch or two on the four sides; mark the four corners with a diamond, draw a corresponding square on the board so that its image shall coincide as nearly as possible with the square drawn on the plate. Unless the mirror is in adjustment, the image is not a square; the adjustment is effected by turning the mirror till the opposite sides of the image become equal.

Let  $A B C D$ , Fig. 19, be the square drawn on the plate and  $E F G H$  the image. The distortion of the sides  $E G$  and  $F H$  can be measured by pinning continuous scales of equal parts to the board along  $E G$  and  $F H$  and counting the number of divisions intercepted on each scale between the lines  $A B$  and  $C D$  of the plate. The

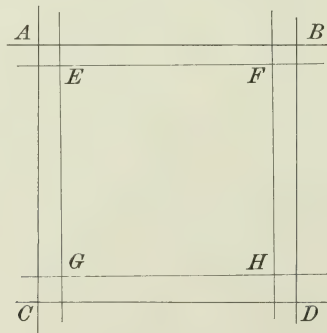


Fig. 19.

ends of the scales only being used, it is sufficient to measure on the board the length of the side of the square in millimetres and to pin at each of the four corners one of the millimetre scales shown in Fig. 10. The number of divisions that would be intercepted if the scales were continuous is readily figured out from the readings of the millimetre scales. The following is the rule for rotating the mirror:—



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If the number of divisions intercepted is greater at the bottom of the plate than at the top, revolve the mirror around its horizontal axis so as to bring the top of the mirror nearer to the plate.

If the number of divisions intercepted is greater on the left of the plate than on the right, turn the mirror clockwise, looking from above, around its vertical axis.

The rule may be put in another form:—

Turn the mirror so as to decrease the distance between the side of the plate intercepting the smaller number of divisions and the corresponding side of the mirror.

After the mirror has once been adjusted, the centre of the plate, that is to say the image of the centre of the board, is marked on the framed glass plate. Whenever it is necessary to adjust the mirror again, for instance when it is changed, it is sufficient to turn it so as to bring into coincidence the image of the centre of the board and the mark for the centre of the plate, without resorting again to the process of adjustment described above.

The examination of the image near the corners of the plate is difficult, especially when the lens is working at a large angle, as it should be in order that the adjustment may be accurate. The difficulty may be overcome by making a negative and measuring the sides of the quadrilateral upon the negative.

Let Fig. 20 represent a horizontal section through the axis of the camera,  $DE$  being the board,  $AB$  the plate,  $G$  the image of the centre,  $C$  of the board,  $D$  and  $E$

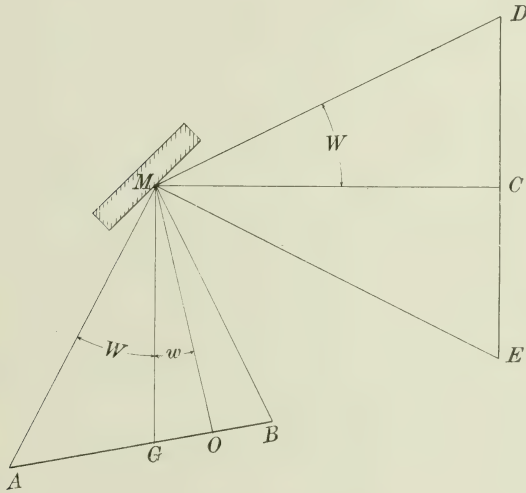


FIG. 20—Adjustment of the Mirror.

the sides of the square on the board,  $A$  and  $B$  the sides of the quadrilateral image,  $W$  the angle subtended at the lens by half of the square,  $L$  the length in millimetres of the left side of the quadrilateral at  $A$ , and  $R$  the length of the right side at  $B$ . As represented by the figure,  $L$  is greater than  $R$ ; to make them equal, the mirror must be turned so as to bring the image of the centre from  $G$  to  $O$ , the line  $MO$  being



perpendicular to the plane of the plate. If a millimetre scale is pinned at  $C$ , the number of divisions  $d$  of the image corresponding to  $GO$  is:

$$d = n(L - R) \left[ \frac{(n+1)f}{P} \right]^2$$

in which  $P$  is the side of the square on the board in millimetres.\* The lengths  $L$  and  $R$  are measured on the negative. The image of the centre must be displaced towards the smaller side of the quadrilateral image.

Likewise, the image of the centre is moved towards the top or bottom according as the top or bottom side of the quadrilateral is smaller, the displacement being calculated by the same formula. In both cases the displacement is readily ascertained by means of the cross lines engraved near the centre of the plate.

Incidentally, it may be observed that the image of a square original whose opposite sides have become unequal through the stretching of the paper can be restored to correct proportions by the adjustment of the mirror calculated by the above formula, the lengths  $L$  and  $R$  being equal to the corresponding lengths of the original divided by  $n$ . The formula for rectangular originals could, if required, be easily calculated. Distortion can also be corrected by a like process in the direct camera. The need of such corrections has, however, not been felt here.

For graduating, the camera is set for a reduction such that the width of the board covers the full width of the plate; the reduction is measured by the process described for the direct camera. Having ascertained this reduction, the lens carriage pointer of the reverse camera is moved to the proper division of the graduation and firmly clamped in position. A mark is made on the bed of the reverse camera opposite the pointer, and the graduation is drawn from this mark by means of the table of the values of

$$\left( 1 + \frac{1}{n} \right) f$$

which has already been calculated for the direct camera.

\* Representing the angle  $GMO$  by  $w$ , the figure gives:

$$MA \times \cos(W + w) = MO$$

$$L = 2 MA \times \sin W$$

Multiplying by  $\cos(W + w)$ :

$$L \cos(W + w) = 2 MO \times \sin W$$

The angle  $w$  being small, its cosine can be taken as unity:

$$L \cos W = 2 MO \times \sin W + L \sin W \sin w$$

The right hand side of the figure gives in the same manner:

$$R \cos W = 2 MO \times \sin W - R \sin W \sin w$$

Subtracting the last equation from the preceding one, and reducing:

$$\sin w = \frac{n(L - R)}{2P \tan W}$$

$$GO = \sin w \times MO = n(L - R) \frac{\left( 1 + \frac{1}{n} \right) f}{2P \tan W}$$

But  $d$ , the number of divisions of the image of the millimetre scale corresponding to  $GO$ , is  $GO \times n$ , and

$$\tan W = \frac{P}{2(1 + n)f}$$

Substituting these values:

$$d = n(L - R) \left[ \frac{(1 + n)f}{P} \right]^2$$



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It has been assumed at the start that the mirror was at the right place on the axis of the camera. This condition may not be accurately fulfilled.

Let Fig. 20a represent a section through the axis  $CP$  of the camera and the geometrical centre,  $O$ , of the glass plate marked by an engraved cross. The camera being set for an enlargement  $n'$ , the mirror  $M$  is turned so as to reflect the image of the optical centre of the board,  $C$ , upon the geometrical centre of the plate  $O$ . Moving the lens carriage to  $NQ$  for a reduction  $n$ , it will usually be found that the point of

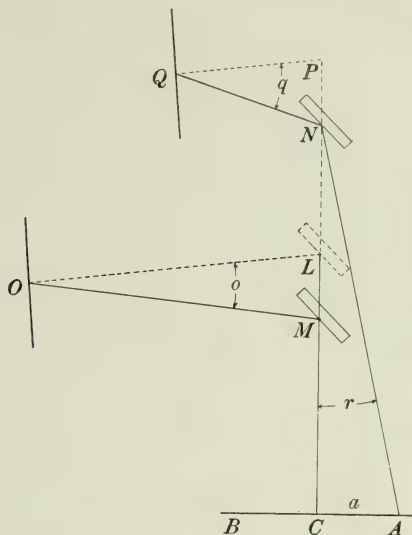


FIG. 20a.—Position of Mirror on the Axis.

the board whose image is reflected upon the central cross of the plate is no longer the centre of the board  $C$ , but a point  $A$ ,  $a$  millimetres away from the centre. In order that the image of the centre  $C$  may always coincide with the central cross of the plate, the mirror must be moved from  $M$  to  $L$ ,  $OL$  being the line followed by the central cross  $O$  when the plate is racked backwards and forwards. The perpendicular distance,  $b$ , between the two positions  $M$  and  $L$  of the mirror is:—

$$b = \frac{a}{\sqrt{2}} \times \frac{1 + n'}{nn' - 1}$$

$a$  is read on the millimetre scale glued to the plug in the centre of the board.\*

\* Let  $QP$  be the direction of translation of the plate parallel to  $OL$ ,  $PN$  being equal to  $LM$ . Designate the angles  $LOM$ ,  $PQN$  and  $CNA$  by  $o$ ,  $q$ , and  $r$  respectively. The angles being small, their values are approximately:—

$$\begin{aligned} o &= \frac{LM}{OM} \\ q &= \frac{PN}{QN} = \frac{LM}{QN} \\ r &= q - o = \frac{LM}{QN} - \frac{LM}{OM} \end{aligned}$$

But:

$$a = r \times CN$$

and:

$$a = CN \times LM \left( \frac{1}{QN} - \frac{1}{OM} \right)$$



In the latest pattern of this copying camera, provision is made for this adjustment. Fig. 20*b* is a section of the mirror box. The mirror slides into the groove *AB*, being pressed forward at the bottom by the brass springs *A* and *B*, and at the top by a spring in the centre, so as to be held by three points only and so to be free from strains. Opposite the point where the optical axis strikes the mirror is a screw *C* screwing through a brass plate *HG* fastened to the mirror box. The rounded head of the screw bears against a brass plate *LK* fastened to the mirror slide. When it is

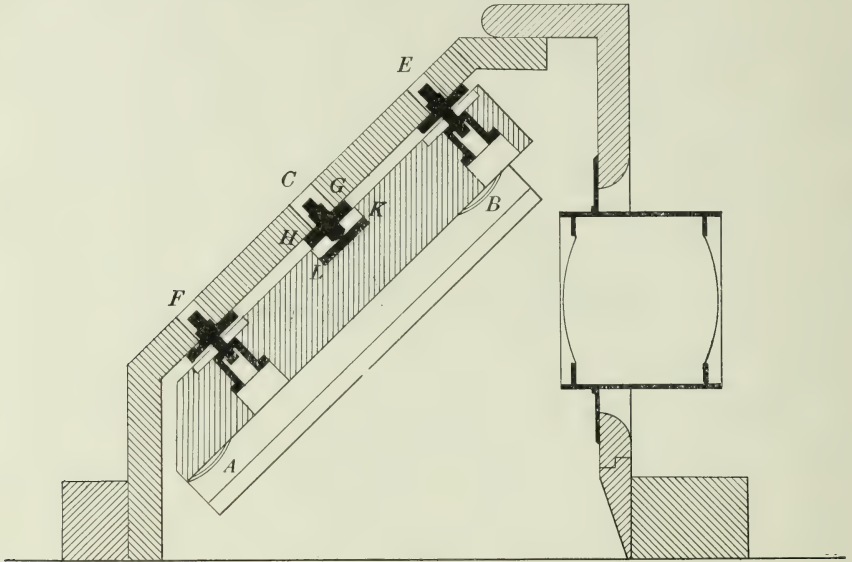


FIG. 20*b*.—Mirror Box.

desired to move the mirror slide forward, the screws *E* and *F* and the two other adjusting screws must first be loosened and then the screw *C* is turned to the right. If the slide has to be moved in the opposite direction, the screw *C* is turned to the left and the four adjusting screws are screwed in so as to bring the mirror slide and plate *LK* in contact with the top of the screw *C*. The number of turns and fraction of a turn necessary for the displacement *b* of the mirror is calculated from the known value of the screw thread.

The board has previously been made perpendicular to the axis when making the adjustments of the direct camera. For finding the centre of the board for the reverse camera, the lens carriage is brought as close to the board as it will go and a set square applied against the board and opposite sides of the lens tube. The point so ascertained is quite accurate enough for practical purposes.

The values of *CN*, *QN* and *OM*, derived from (1), (2) and (4), are:

$$CN = (1+n)f$$

$$QN = \left(1 + \frac{1}{n}\right)f$$

$$OM = (1+n')f$$

Substituting these values in the preceding equation and reducing:

$$LM = a \frac{1+n'}{nn'-1}$$

The mirror being inclined at  $45^\circ$  to the axis the perpendicular distance *b* between the two positions *M* and *L* is equal to *LM* divided by the square root of two, or:

$$b = \frac{a}{\sqrt{2}} \times \frac{1+n'}{nn'-1}$$



## PART II.—THE ILLUMINATION OF THE BOARD.

### 18. Lights and Reflexions.

Electric light is so much more convenient than daylight for copying that there can be no hesitation in selecting between the two. Two kinds of light are available, viz., the mercury tube and the arc lamp. The latter is in use here.

In disposing the lights, care must be taken to secure even illumination and to avoid reflexions. Photographs on glossy paper, varnished paintings, etc., are apt to cause trouble unless the lights are outside the range of reflexion. It is different with drawings: an original on glossy tracing linen may yield a perfect negative, while one on dull paper photographed under identical conditions may produce a negative in which the lines are more or less fogged. The explanation is that the reflexions which cause the trouble are from the surface of the ink lines, while those from the blank spaces are comparatively harmless. Ordinary Indian ink dries shiny. Several photo-drawing inks are in the market, but they are not in favour with draughtsmen.

The light from an alternating current lamp is fairly uniform in all directions within a wide angle; this is not the case with direct current lamps, and the remarks which follow do not apply to them. The intensity of an arc lamp fluctuates considerably: any conclusion that may be arrived at respecting the strength of the illumination produced must be taken as a rough approximation only. Fortunately moderate variations from the normal exposure do not affect the quality of the negative.

### 19. Light Intensities with One Lamp.

The brightness of a surface, *BC*, Fig. 21, at various distances from a source of

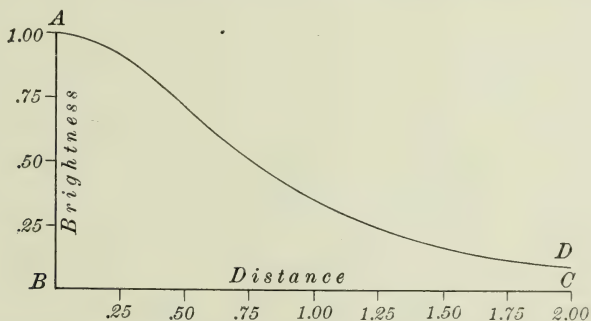


FIG. 21—Illumination of a surface by a luminous point.

light, *A*, is represented by the curve *AD*. The curve shows that the brightness is tolerably uniform just opposite the light but falls off rapidly as the distance increases. It follows that unless the original to be copied is small, a single arc lamp has to be far away in order to give even illumination. Moreover, it has to be placed to one side for avoiding reflexions, and this is apt to show the grain of the paper.



## 20. Light Intensities with Two Lamps.

With two lamps, conditions are improved. Fig. 22 shows the brightness at several points of a square illuminated by two lamps opposite *A* and *B* at a distance from the square equal to half of its diagonal, the brightness of one lamp at that distance being taken as unit. The brightness is greatest just opposite the lamps and somewhat less in the centre, but it falls off rapidly away from the middle line, being only six-tenths of the greatest brightness at the top and bottom of the square. The best illumination is secured by placing the longest dimension of the original to be copied in the direction of the line of the lamps.

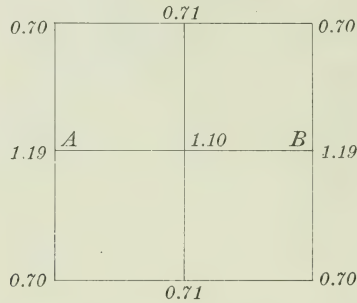


FIG. 22.—Brightness of a square illuminated by two lamps

By increasing the distance of the lamps one-fifth, making it equal to  $AB \times .85$ , the uniformity of the illumination, shown in Fig. 23, is somewhat better; it is uniform along the middle line, and nearly seven-tenths of its greatest value at the top and bottom of the square. This illumination is sufficient to yield a good nega-

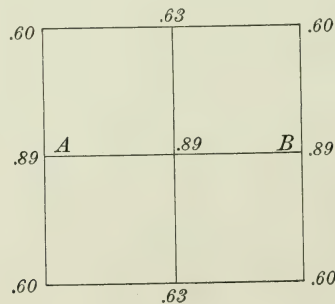


FIG. 23—Brightness of a square illuminated by two lamps.

tive of a line drawing. Still the operator might as well have all chances in his favour, and a better result is obtained with four lamps.



## 21. Light Intensities with Four Lamps.

The most even illumination in this case is secured by placing the lamps at equal distances from the board and from the axis of the camera.

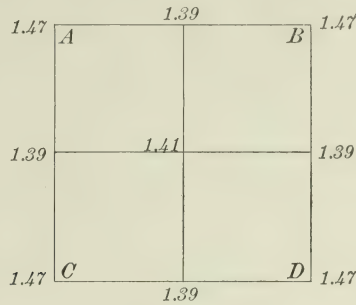


FIG. 24—Brightness of a square illuminated by four lamps.

Fig. 24 shows the brightness of a square illuminated by four lamps opposite the corners *A, B, C, D*, the distance from the board being equal to  $\frac{1}{2} AB \sqrt{2}$ . By placing the lamps a little closer to the board, the brightness is greater at the margin than in the centre, and this is as it should be for producing even illumination on the plate.

## 22. Reflexions and Focal Length of the Lens for Two Lamps.

The trouble from reflexions is not peculiar to artificial light; it arises in daylight from a bright background behind the camera or from light reflected by a polished camera front or by the lens mount. No good reason exists why the front of

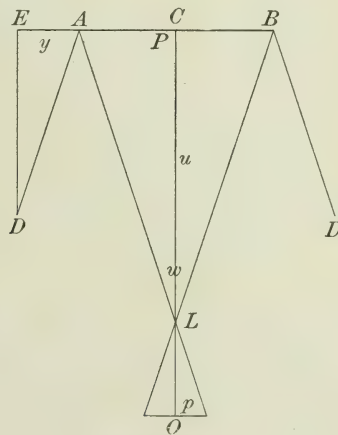


FIG. 25.

the camera should be polished; it is preferable to have it dull and dark. A lens protected by a deep hood, as it should always be, cannot reflect stray light. The space behind the camera should preferably be dark.



Arc lamps must be placed far enough from the axis of the camera to be beyond the range of reflexion, their distance depending upon the dimensions of the original to be copied and the focal length of the lens. Considering first the case of two lamps, let *AB*, Fig. 25, represent the original pinned to the board, *OC* the axis of the camera, *L* the lens, *u* the distance from the lens to the board, *O* the plate, *P* and *p* the widths of the original and plate. From *A* and *B* draw the lines *AD* and *BD'*, making the same angle with the board as *AL* and *BL*. Reflexions are avoided if the lamps are kept outside of the lines *AD* and *BD'*. Let them be put in *D* and *D'*. From *D* let fall a perpendicular *DE* to the plane of the board, and denote *AE* by *y*. It has been shown that in order to produce tolerably uniform illumination, the distance *DE* from the lamps to the board must be about  $.85 \times 2 \text{ } EC$ , or:

$$DE = .85 (2 \text{ } y + P)$$

Similar triangles give:

$$\frac{DE}{y} = \frac{u}{\frac{1}{2} P}$$

Combining the two equations:

$$\frac{2 \text{ } y + P}{P} = \frac{\frac{u}{P}}{P - .85} \tag{9}$$

$2 \text{ } y + P$  is the separation *DD'* of the two lamps. The numerical value of the ratio  $\frac{2 \text{ } y + P}{P}$  for the various values of  $\frac{u}{P}$  and the angle  $2 \text{ } W$  subtended at the lens by the width of the original, are given below:—

$\frac{u}{P}$	$\frac{2y+P}{P}$	$2 \text{ } W$
1	6.67	53°
2	1.74	28
2.55	1.50	22
3	1.40	19
4	1.27	14
5	1.20	11

These figures illustrate how important it is to work with a lens of long focus. For:

$$\frac{u}{P} = 1$$

that is to say when the distance from the lens to the board is equal to the width of the original, the separation of the lamps must be 6.67 times the width of the original and their distance from the board 5.67 times the width. This would be impracticable for originals of large dimensions. For convenience in working, the lamps should not be farther apart than one and a half times the width of the largest originals. The table shows that this requirement is fulfilled when the distance from the lens to the board is 2.55 times the width of the original, the angle subtended at the lens being 22°.



## SESSIONAL PAPER No. 25b

The limitation of the separation of the lamps to one and a half times the width of the original determines the minimum focal length of the lens. Noting that:

$$P = np$$

$$u = (n + 1)f$$

and

$$y = \frac{1}{4}P$$

Equation (9) gives:

$$f = 2.55p \frac{n}{n+1}$$

This shows that the greater the reduction, the longer the focal length must be. For a reduction not exceeding 1.25:

$$f = 1.45 p$$

This is very nearly the diagonal of a square plate. The rule sometimes given in text books that the focal length must be equal to the diagonal of the plate is therefore correct so long as the reduction is small. For a reduction of 3.00 the focal length would have to be

$$f = 1.9 p$$

which is 1.34 times the diagonal.

The conclusion that the focal length required increases with the reduction must be qualified. It rests upon the assumption that the whole plate is covered by the image, but when the reduction reaches a certain limit, the image with originals of ordinary dimensions becomes too small to cover the plate and the rule ceases to apply.

Another conclusion from (9) is that the wider the original, the farther apart the lamps have to be. For a rectangular original, the best position for avoiding reflexions is accordingly across the line of the lamps, the longest dimension being vertical if the lamps are to the right and left of the camera. But it has been shown that the most uniform illumination is secured when the longest dimension is parallel to the line of the lamps; this is another argument against the use of only two lamps for large work.

### 23. Reflexions and Focal Length of the Lens for Four Lamps.

With a four lamps outfit,  $D$  and  $D'$ , Fig. 25, may be taken to represent the projections of the lamps. It was found that for uniform illumination:

$$DE = \frac{1}{2}P\sqrt{2}$$

This and a consideration of the similar triangles in the figure give:

$$\frac{2y + P}{P} = \frac{\frac{u}{P}}{\frac{u}{P} - .7}$$

The numerical values of the ratio,  $\frac{2y + P}{P}$ , of the distance between two adjoining lamps to the width of the original, and of the angle  $2W$  subtended at the lens, is given below for various values of  $\frac{u}{P}$



$\frac{u}{P}$	$\frac{2y+P}{P}$	$2 W$
1	3.42	53°
2	1.55	28
2.12	1.50	27
3	1.31	19
4	1.22	14
5	1.16	11

A comparison with the table for two lamps shows at once the superiority of the four lamps equipment. The lamps need not be put so far apart, and they are closer to the board, thus giving stronger illumination. For instance, when the distance from the lens to the board is twice the width of the original ( $\frac{u}{P} = 2$ ), the separation of the two lamps of a pair (side of the square) is only 1.55 times the width of the original, while it is 1.74 times the width with two lamps. The four lamps are at a distance 1.1  $P$  from the board against 1.5  $P$  for two lamps. Another advantage is that it is sufficient to place the four lamps beyond the range of reflexion for the shortest dimension of the original, while the two lamps must be beyond the range for the greatest dimension.

Limiting again the separation of the two lamps of a pair to one and a half times the width of the original, the focal length required is deduced as before:

$$f = 2.12p \frac{n}{n+1}$$

(10)

The largest plate of the camera of the Surveyor General's office is 24" × 32". The lens was selected and the lamps disposed for a reduction of 2.00. The original which, reduced twice, fills the plate must be 48" × 64"; no larger originals are handled in the office. The lamps are placed above and below the range of reflexion, that is to say the height of the plate, 24" is taken for  $p$  in (10). The formula gives:

$$f = 33".9$$

The focal length of the lens actually used is 33.7 inches (856.4 mm.); it is employed for enlargements and for reductions up to 2.45 when the plate carriage is at the extreme end of the cradle.

For the reduction of 2.00, the original being 48 inches high, the normal disposition of the lamps would be a square of 72 inches side (one and a half times 48 inches), and their distance from the board seven-tenths of 72 inches or 50 inches. They have, however, been placed a little closer to the board and form a smaller square so as to give more light to the margin of the board than to the centre. According to the explanation given, there can be no reflexion up to a reduction of 2.00, nor can there be any between 2.00 and 2.45, because the image no longer fills the plate.

Very little work requires a reduction of more than 2.45. For such work a lens of 18".6 focus (472.9 mm.) is provided; its range extends from 2.45 to 6.65, in connection with small plates, the image being always small with such large reductions. This small lens is also used on the reverse camera, which is for work of comparatively small size. Its range there is from an enlargement of 1.20 to a reduction of 5.80.



PART III



TABLE







**PART III.—TABLE OF FACTORS FOR COMPUTING THE GRADUATION OF  
A COPYING CAMERA AND OF COMPARATIVE EXPOSURES.**

Reduction or Enlargement	Lens Carriage	Plate Carriage	COMPARATIVE EXPOSURES.		Reduction or Enlargement	Lens Carriage	Plate Carriage	COMPARATIVE EXPOSURES.	
			Enlarging (1+n) <sup>2</sup>	Reducing (1+ $\frac{1}{n}$ ) <sup>2</sup>				Enlarging (1+n) <sup>2</sup>	Reducing (1+ $\frac{1}{n}$ ) <sup>2</sup>
<i>n</i>	$1 + \frac{1}{n}$	$2 + n + \frac{1}{n}$			<i>n</i>	$1 + \frac{1}{n}$	$2 + n + \frac{1}{n}$		
1.00	2.00000	4.00000	4.0	4.0	3.25	1.30769	5.55769	18.1	1.7
.05	1.95238	.00238	.2	3.8	.30	.30303	.60303	.5	
.10	.90909	.00909	.4	.6	.35	.29850	.64850	18.9	
.15	.86956	.01956	.6	.4	.40	.29411	.69411	19.4	
.20	.83333	.03333	.8	.3	.45	.28985	.73985	.8	1.6
.25	.80000	.05000	5.0	.2	.50	.28571	.78571	20.2	
.30	.76923	.06923	.3	.1	.55	.28169	.83169	.7	
.35	.74074	.09074	.5	.0	.60	.27777	.87777	21.2	
.40	.71428	.11428	.7	2.9	.65	.27397	.92397	.6	
.45	.68965	.13965	6.0	.8	.70	.27027	.97027	22.1	
.50	.66666	.16666	.2	.7	.75	.26666	6.01666	.6	
.55	.64516	.19516	.5	.6	.80	.26315	.06315	23.0	
.60	.62500	.22500	.7	.6	.85	.25974	.10974	.5	
.65	.60606	.25606	7.0	.5	.90	.25641	.15641	24.0	
.70	.58823	.28823	.2	.4	.95	.25316	.20316	.5	
.75	.57142	.32142	.5	.4	4.00	.25000	.25000	25.0	
.80	.55555	.35555	.8	.4	.05	.24691	.29691	.5	1.5
.85	.54054	.39054	8.1	.3	.10	.24390	.34390	26.0	
.90	.52631	.42631	.4	.3	.15	.24096	.39096	.5	
.95	.51282	.46282	.7	.2	.20	.23809	.43809	27.0	
2.00	.50000	.50000	9.0	.2	.25	.23529	.48529	.6	
.05	.48780	.53780	.3	.2	.30	.23255	.53255	28.1	
.10	.47619	.57619	.6	.2	.35	.22988	.57988	.6	
.15	.46511	.61511	.9	.1	.40	.22727	.62727	29.2	
.20	.45454	.65454	10.2	.1	.45	.22471	.67471	.7	
.25	.44444	.69444	.6	.1	.50	.22222	.72222	30.2	
.30	.43478	.73478	.9	.0	.55	.21978	.76978	.8	
.35	.42553	.77553	11.2	.0	.60	.21739	.81739	31.4	
.40	.41666	.81666	.6	.0	.65	.21505	.86505	.9	
.45	.40816	.85816	.9	.0	.70	.21276	.91276	32.5	
.50	.40000	.90000	12.2	.0	.75	.21052	.96052	33.1	
.55	.39215	.94215	.6	1.9	.80	.20833	7.00833	.6	1.4
.60	.38461	.98461	.9	.9	.85	.20618	.05618	34.2	
.65	.37735	5.02735	13.3	.9	.90	.20408	.10408	.8	
.70	.37037	.07037	.7	.9	.95	.20202	.15202	35.4	
.75	.36363	.11363	14.1	.8	5.00	.20000	.20000	36.0	
.80	.35714	.15714	.4	.8	.05	.19801	.24801	.6	
.85	.35087	.20087	.8	.8	.10	.19607	.29607	37.2	
.90	.34482	.24482	15.2	.8	.15	.19417	.34417	.8	
.95	.33898	.28898	.6	.8	.20	.19230	.39230	38.4	
3.00	.33333	.33333	16.0	.8	.25	.19047	.44047	39.1	
.05	.32786	.37786	.4	.7	.30	.18867	.48867	.7	
.10	.32258	.42258	.8	.7	.35	.18691	.53691	40.3	
.15	.31746	.46746	17.2	.7	.40	.18518	.58518	41.0	
.20	.31250	.51250	.6	.7	.45	.18348	.63348	.6	

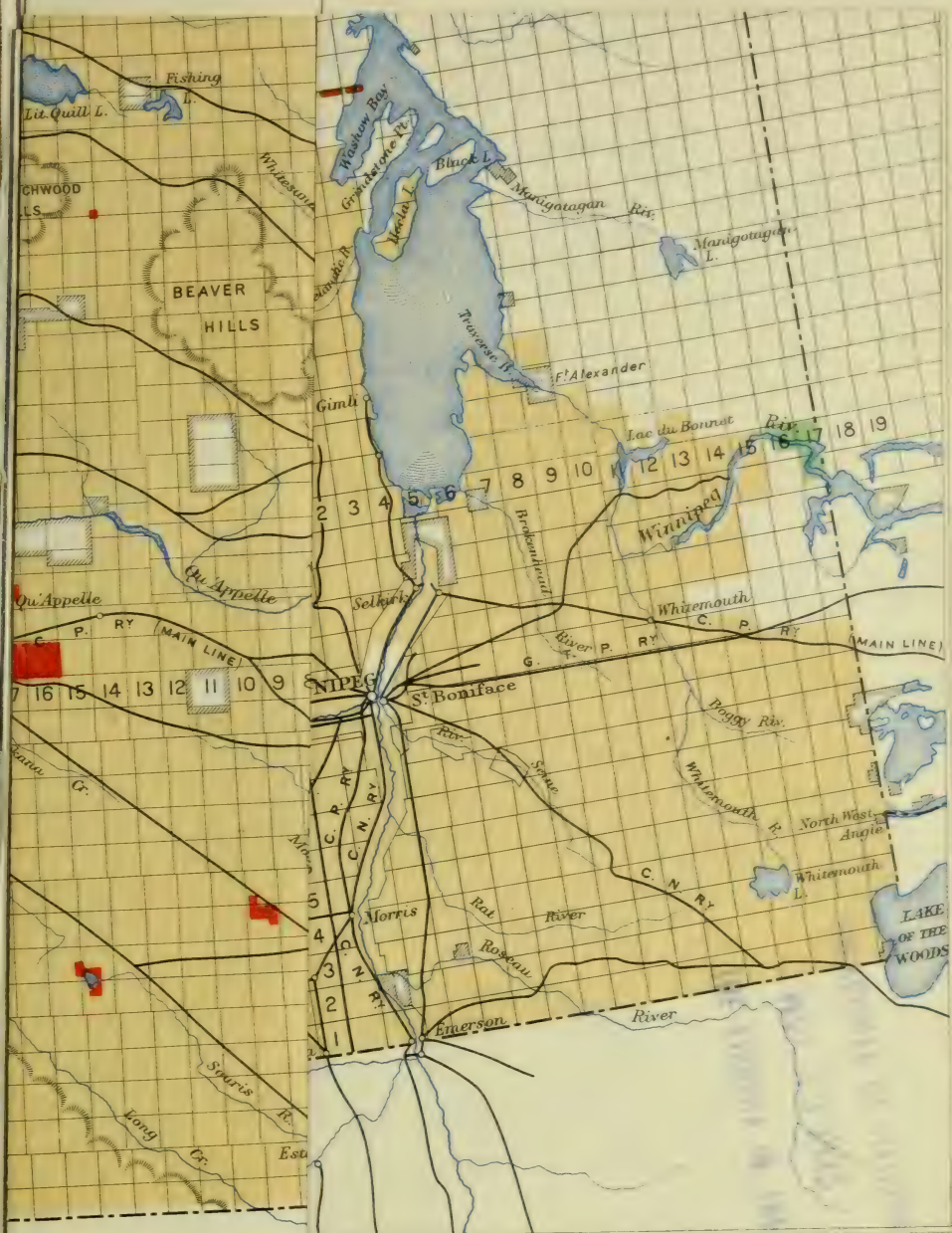


# FACTORS FOR COMPUTING GRADUATION OF COPYING CAMERA AND COMPARATIVE EXPOSURES.

Reduction or Enlargement	Lens Carriage	Plate Carriage	COMPARATIVE EXPOSURES.		Reduction or Enlargement	Lens Carriage	Plate Carriage	COMPARATIVE EXPOSURES.	
			Enlarging	Reducing				Enlarging	Reducing
$n$	$1 + \frac{1}{n}$	$2 + n + \frac{1}{n}$	$(1+n)^2$	$(1+\frac{1}{n})^2$	$n$	$1 + \frac{1}{n}$	$2 + n + \frac{1}{n}$	$(1+n)^2$	$(1+\frac{1}{n})^2$
5.50	1.18181	7.68181	42.2	1.4	7.75	1.12903	9.87903	76.	1.2
.55	.18018	.73018	.9		.80	.12820	.92820	77.	
.60	.17857	.77857	43.6		.85	.12738	.97738	78.	
.65	.17699	.82699	44.2		.90	.12658	10.02658	79.	
.70	.17543	.87543	.9		.95	.12578	.07578	80.	
.75	.17391	.92391	45.6		8.00	.12500	.12500	81.	
.80	.17241	.97241	46.2		.05	.12422	.17422	81.	
.85	.17094	8.02094	.9		.10	.12345	.22345	82.	
.90	.16949	.06949	47.6	1.3	.15	.12269	.27269	83.	
.95	.16806	.11806	48.3		.20	.12195	.32195	84.	
6.00	.16666	.16666	49.0		.25	.12121	.37121	85.	
.05	.16528	.21528	.7		.30	.12048	.42048	86.	
.10	.16393	.26393	50.4		.35	.11976	.46976	87.	
.15	.16260	.31260	51.1		.40	.11904	.51904	88.	
.20	.16129	.36129	.8		.45	.11834	.56834	89.	
.25	.16000	.41000	52.6		.50	.11764	.61764	90.	
.30	.15873	.45873	53.3		.55	.11695	.66695	91.	
.35	.15748	.50748	54.0		.60	.11627	.71627	92.	
.40	.15625	.55625	.8		.65	.11560	.76560	93.	
.45	.15503	.60503	55.5		.70	.11494	.81494	94.	
.50	.15384	.65384	56.2		.75	.11428	.86428	95.	
.55	.15267	.70267	57.0		.80	.11363	.91363	96.	
.60	.15151	.75151	.8		.85	.11299	.96299	97.	
.65	.15037	.80037	58.5		.90	.11235	11.01235	98.	
.70	.14925	.84925	59.3		.95	.11173	.06173	99.	
.75	.14814	.89814	60.1		9.00	.11111	.11111	100.	
.80	.14705	.94705	.8		.05	.11049	.16049	101.	
.85	.14598	.99598	61.6		.10	.10989	.20989	102.	
.90	.14492	9.04492	62.4		.15	.10928	.25928	103.	
.95	.14388	.09388	63.2		.20	.10869	.30869	104.	
7.00	.14285	.14285	64.0		.25	.10810	.35810	105.	
.05	.14184	.19184	.8		.30	.10752	.40752	106.	
.10	.14084	.24084	65.6		.35	.10695	.45695	107.	
.15	.13986	.28986	66.4		.40	.10638	.50638	108.	
.20	.13888	.33888	67.2		.45	.10582	.55582	109.	
.25	.13793	.38973	68.1		.50	.10526	.60526	110.	
.30	.13698	.43698	.9		.55	.10471	.65471	111.	
.35	.13605	.48605	69.7		.60	.10416	.70416	112.	
.40	.13513	.53513	70.6		.65	.10362	.75362	113.	
.45	.13422	.58422	71.4		.70	.10309	.80309	114.	
.50	.13333	.63333	72.2		.75	.10256	.85256	115.	
.55	.13245	.68245	73.1		.80	.10204	.90204	117.	
.60	.13157	.73157	74.0		.85	.10152	.95152	118.	
.65	.13071	.78071	.8		.90	.10101	12.00101	119.	
.70	.12987	.82987	75.7	1.2	.95	.10050	.05050	120.	



Scale, 35 miles to an inch  $\frac{1}{2217600}$



ZINCOGRAPHED AT THE SURVEYOR GENERAL'S OFFICE OTTAWA, CANADA

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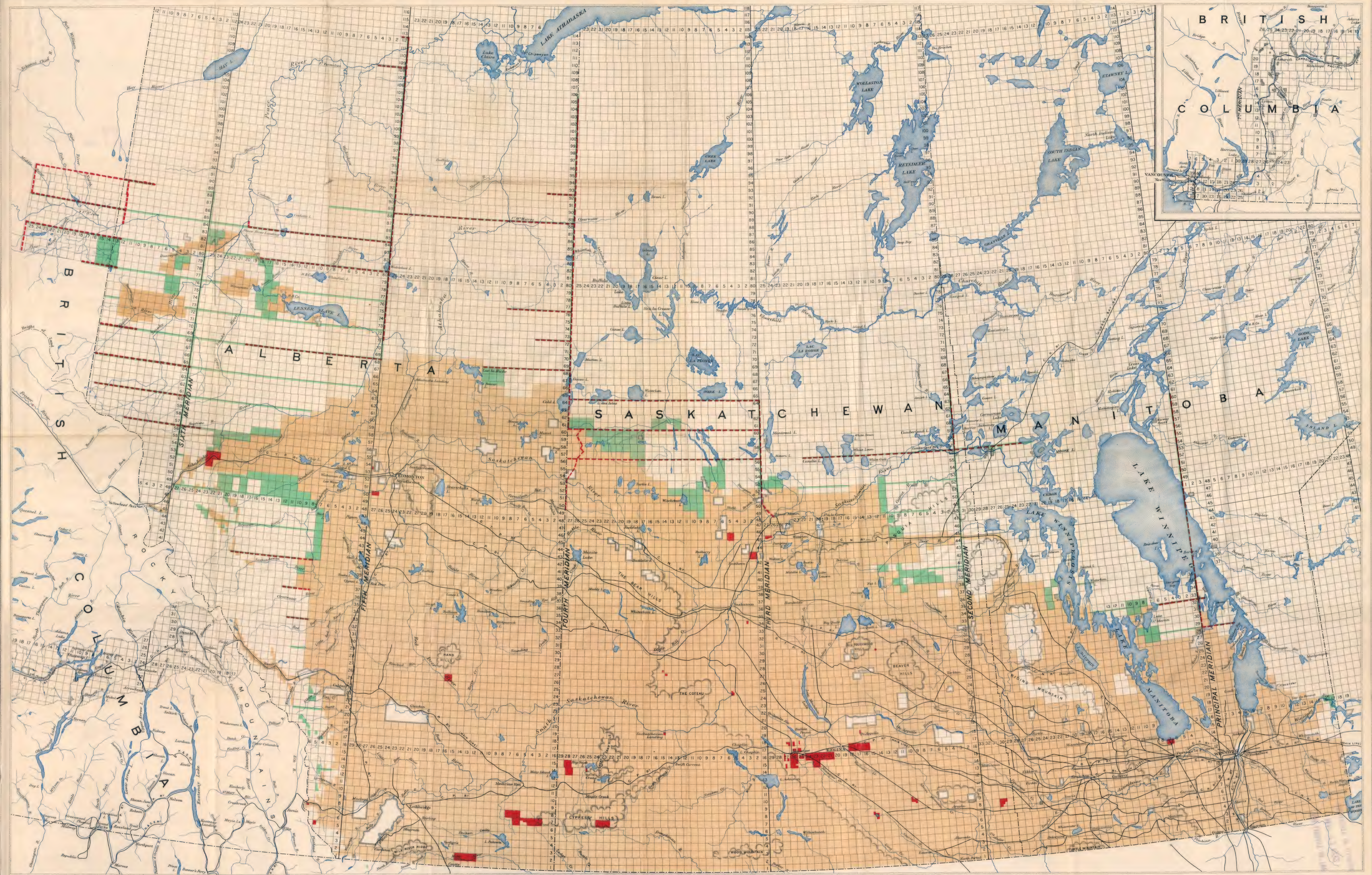
Printed Complete.

# INDEX TO TOWNSHIPS IN MANITOBA, SASKATCHEWAN, ALBERTA AND BRITISH COLUMBIA

To Illustrate Progress of Dominion Lands Surveys

Annual report of the Topographical Surveys Branch, Department of the Interior, 1911-1912.

Scale, 35 miles to an inch  
2917000



Subdivision surveys made prior to March 31, 1911  
Subdivision surveys made from April 1, 1911 to March 31, 1912  
Resurveys made from April 1, 1911 to March 31, 1912

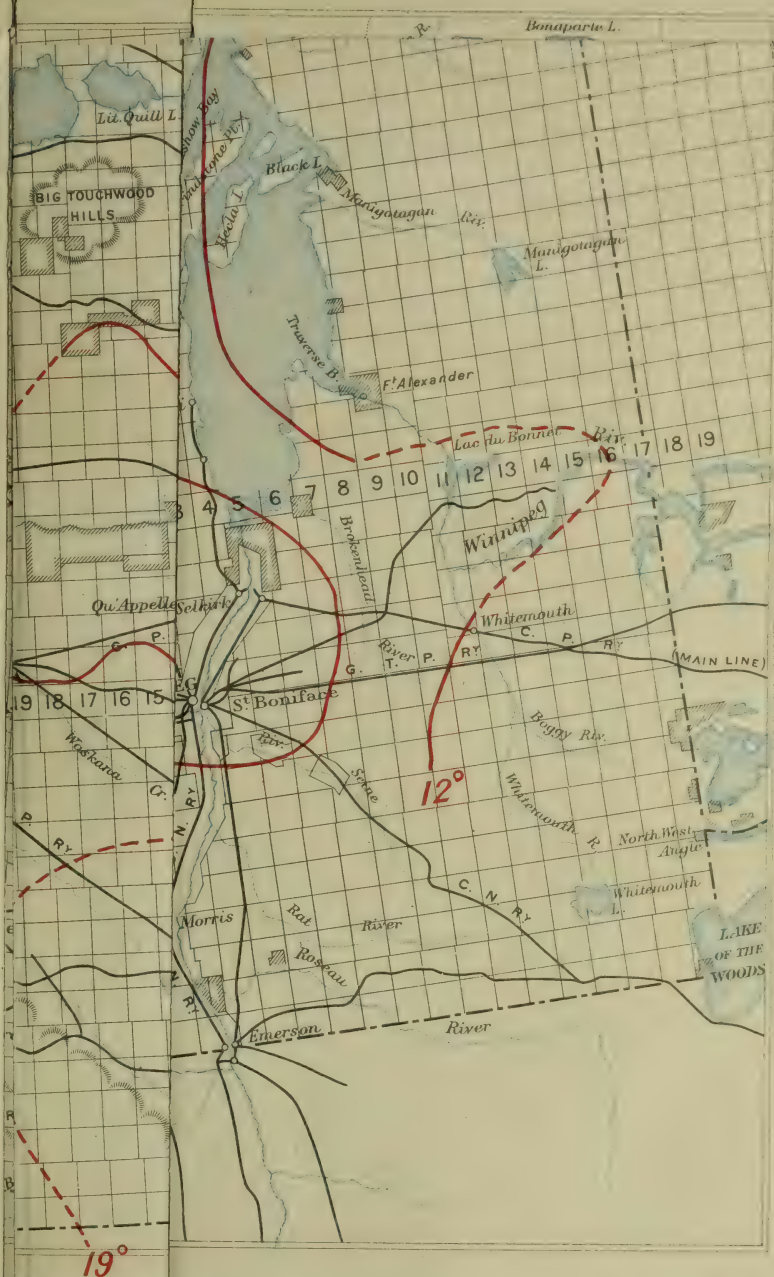
CAUTION:—This is only an index, topographical and other features are not to be depended upon.

Surveys in the Railway Belt in British Columbia are not shown owing to their scattered nature.  
Lines of spirit levels run prior to March 31, 1912  
Base and meridian lines run prior to March 31, 1912



# STE 1912

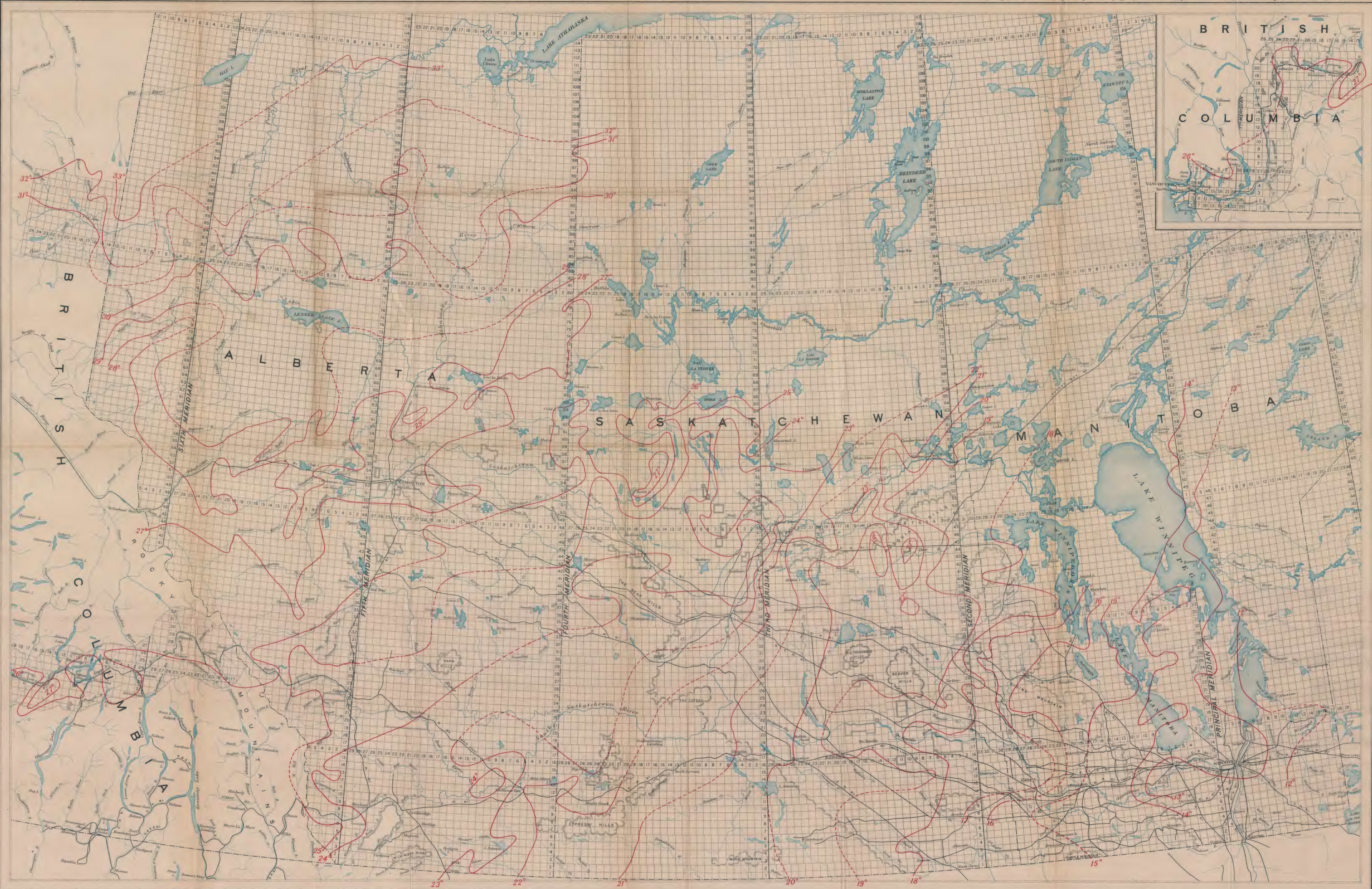
Department of the Interior, 1911-1912



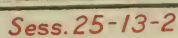


MAP SHOWING THE AZIMUTH OF MAGNETIC NORTH IN WESTERN CANADA FOR JANUARY 1912

*To accompany the Annual Report of the Topographical Surveys Branch, Department of the Interior, 1911-1912*





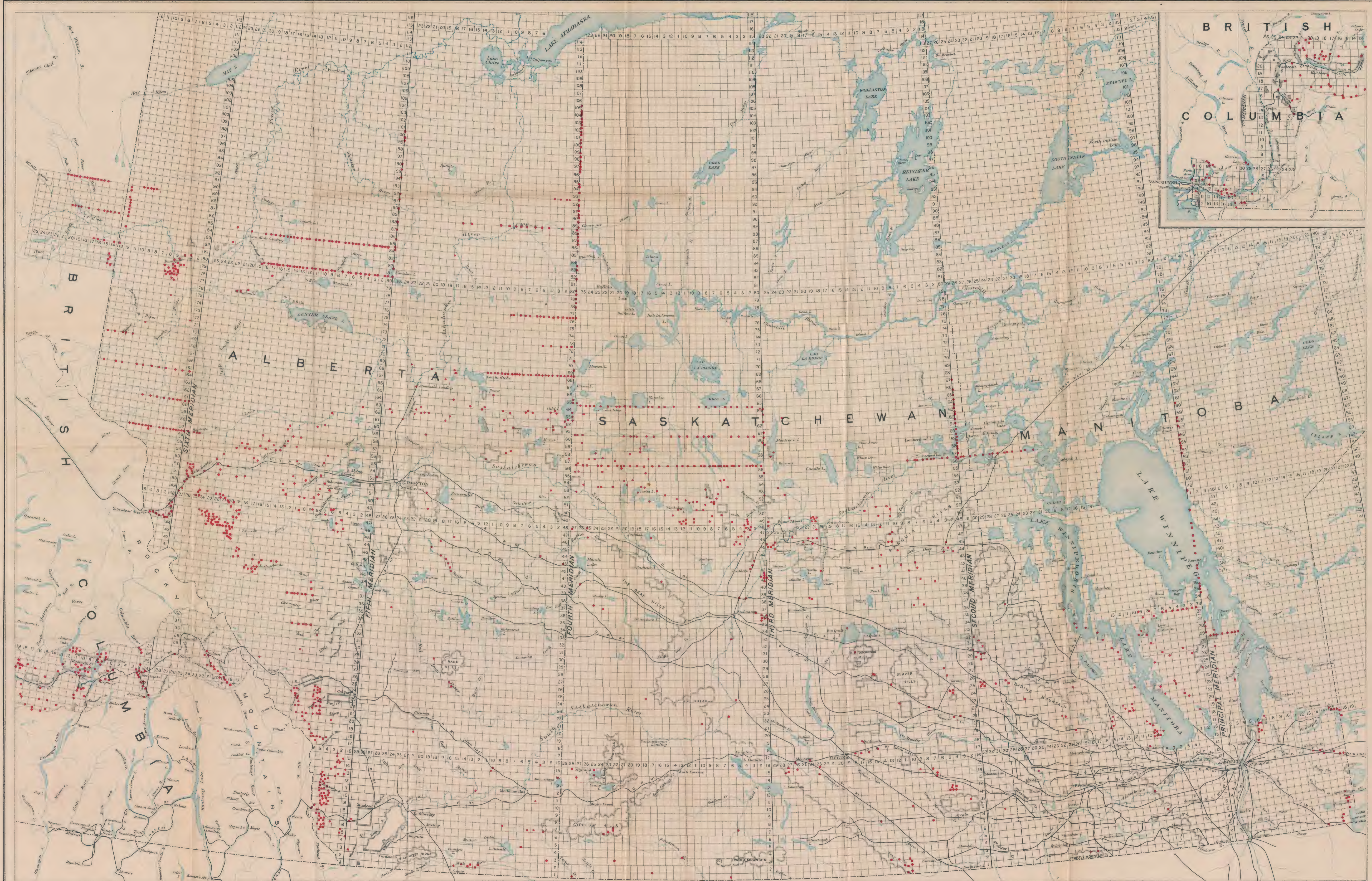




# MAP SHOWING POSITIONS OF MAGNETIC STATIONS OCCUPIED TO DECEMBER 31, 1911

Scale, 35 miles to an inch.

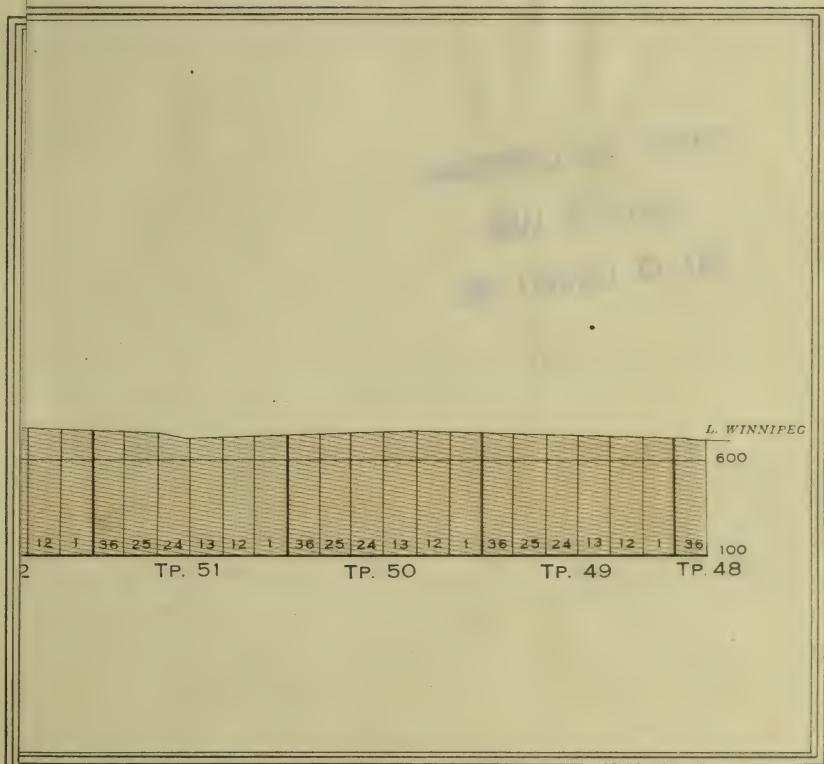
To accompany the Annual Report of the Topographical Surveys Branch, Department of the Interior, 1911-1912





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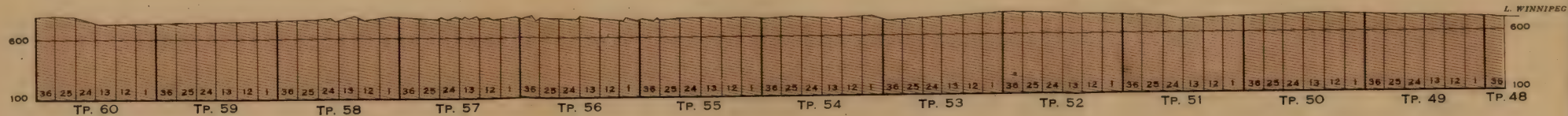
To accompany report of A. W. Ponton, D.L.S.





From levels taken by A. W. Ponton, D.L.S. in 1911

SCALE:—VERTICAL, 1,000 FEET TO AN INCH.  
HORIZONTAL, 6 MILES TO AN INCH.



NOTE: The elevations are referred to a datum of 710 feet for the elevation of the water level of Lake Winnipeg at time of survey.



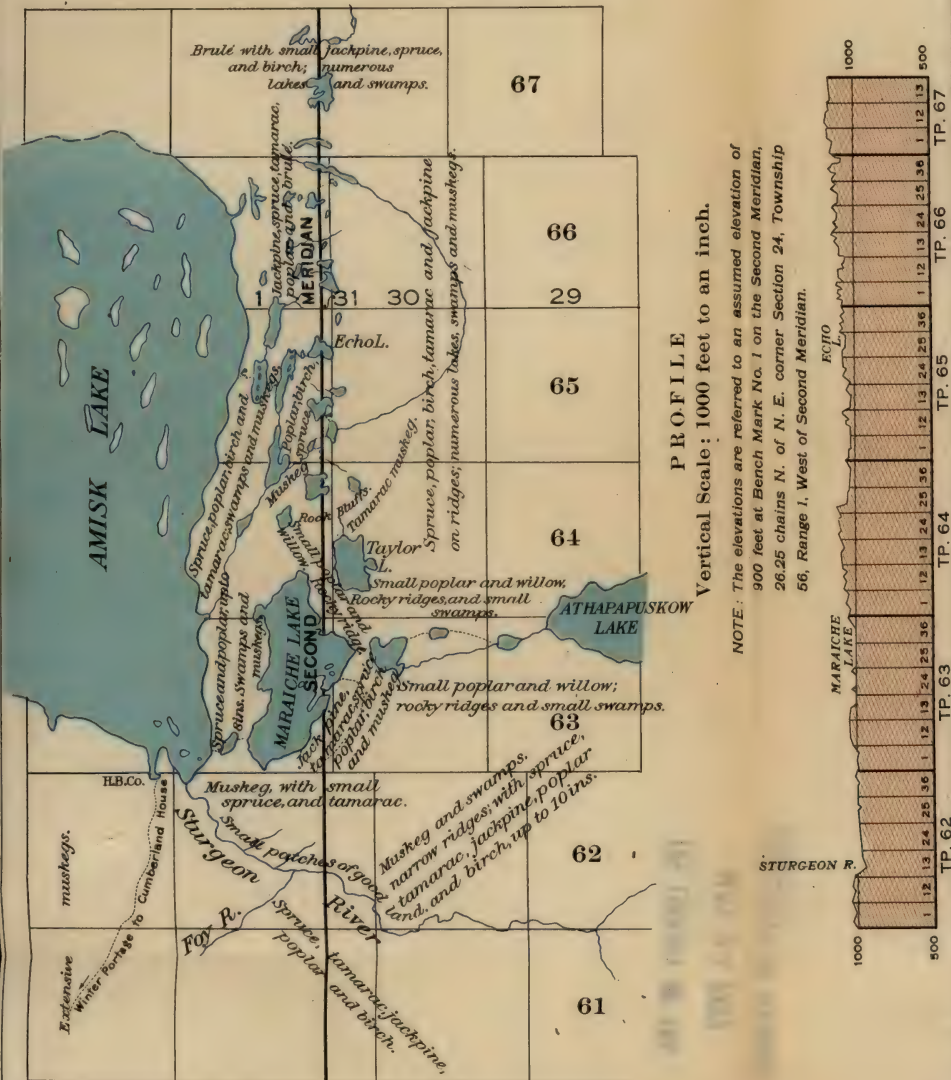




# SKETCH MAP OF THE SECOND MERIDIAN

From Township 62 to Township 67.

Scale: 6 miles to an inch.





To accompany the report of E. W. Robinson, D.L.S.

SKETCH M  
FIFTEENTH  
Across Range  
ST OF SECON

Scale: 6 miles



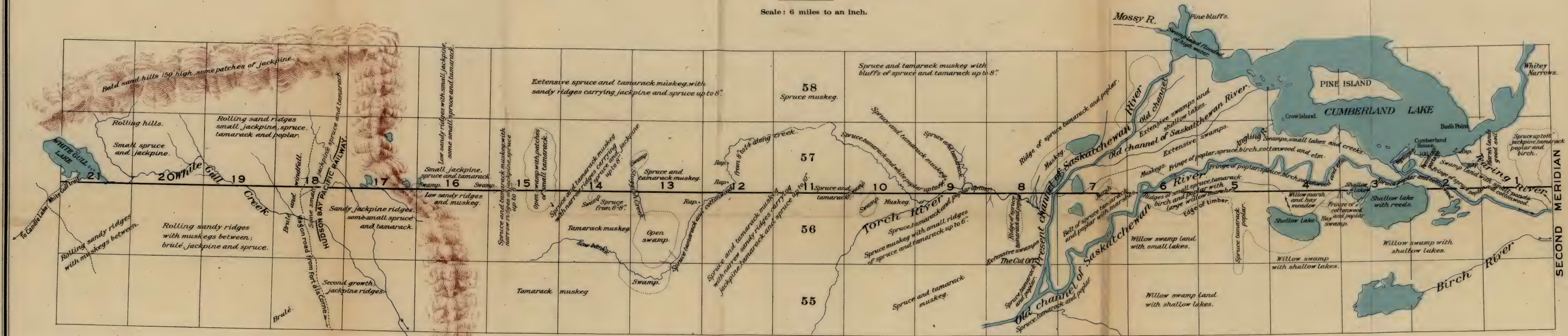


# SKETCH MAP OF THE FIFTEENTH BASE LINE

Across Ranges 1 to 21

WEST OF SECOND MERIDIAN

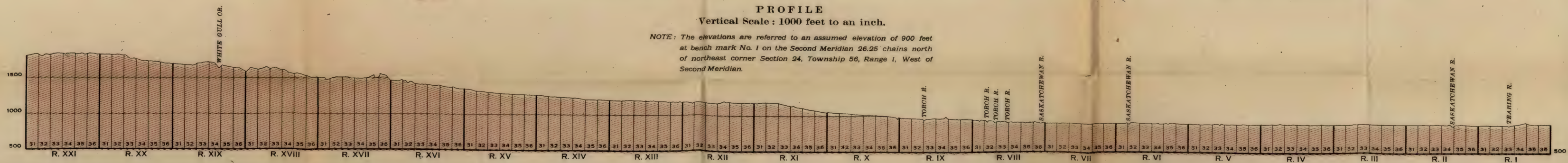
Scale: 6 miles to an inch.



## PROFILE

Vertical Scale: 1000 feet to an inch.

NOTE: The elevations are referred to an assumed elevation of 900 feet at bench mark No. 1 on the Second Meridian 26.25 chains north of northeast corner Section 24, Township 56, Range 1, West of Second Meridian.



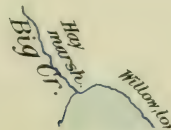


38

37

66

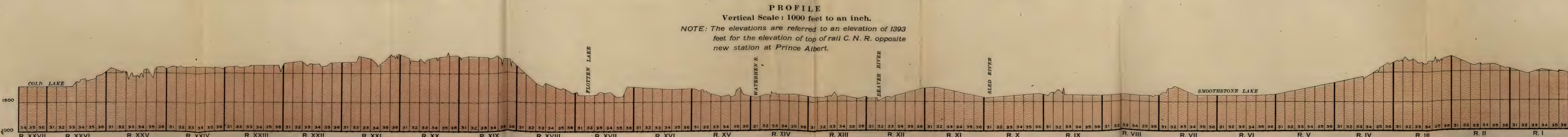
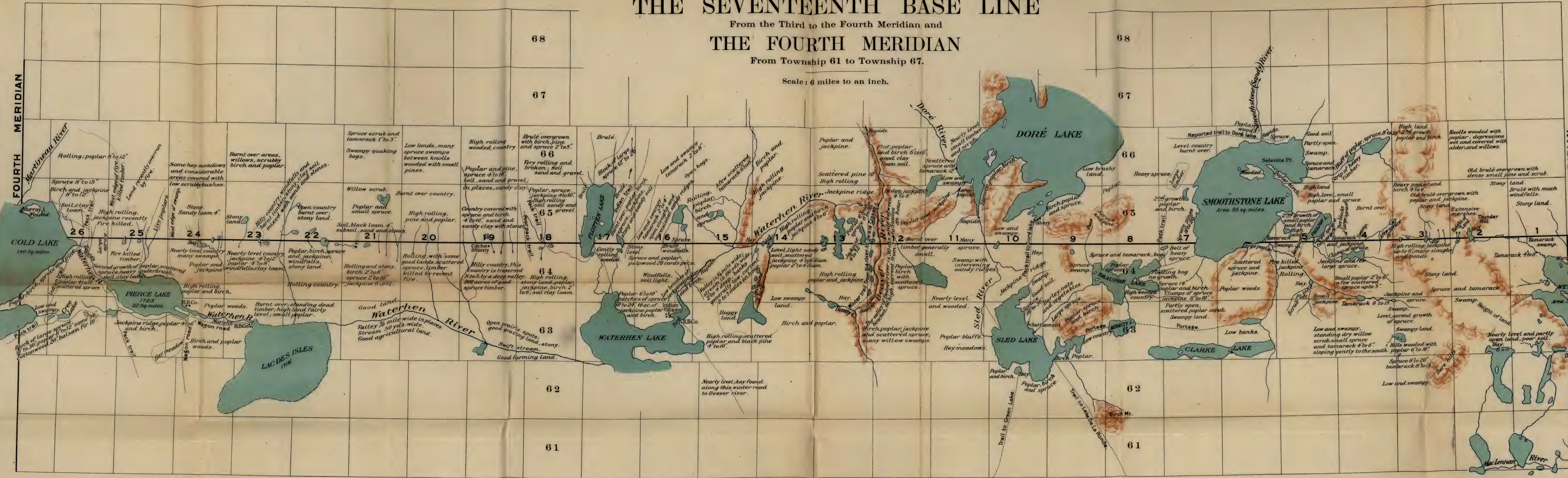
SKETCH OF  
MONTREAL LAKE



Montreal R.



SKETCH MAP OF  
THE THIRD MERIDIAN  
From the Sixteenth to the Seventeenth Base Line  
THE SEVENTEENTH BASE LINE  
From the Third to the Fourth Meridian and  
THE FOURTH MERIDIAN  
From Township 61 to Township 67.  
Scale: 6 miles to an inch.



SKETCH OF  
MONTREAL LAKE



Black 3173 = 455  
Blue 3318 = 264  
Brown 1547 = 105  
\$4500  
\$2640  
\$1050  
\$8240

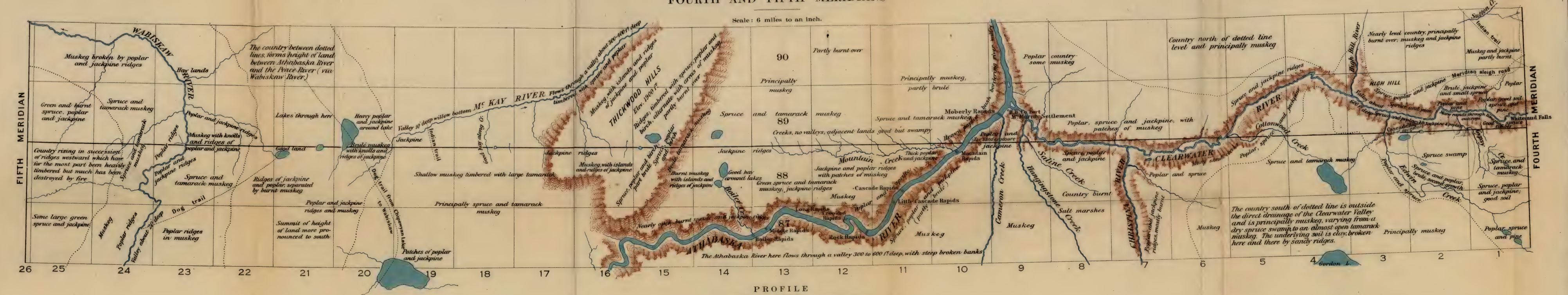




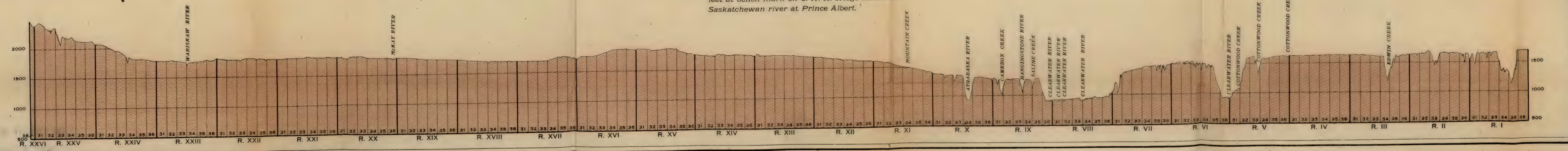


SKETCH MAP OF  
THE TWENTY-THIRD BASE LINE  
Between the  
FOURTH AND FIFTH MERIDIANS

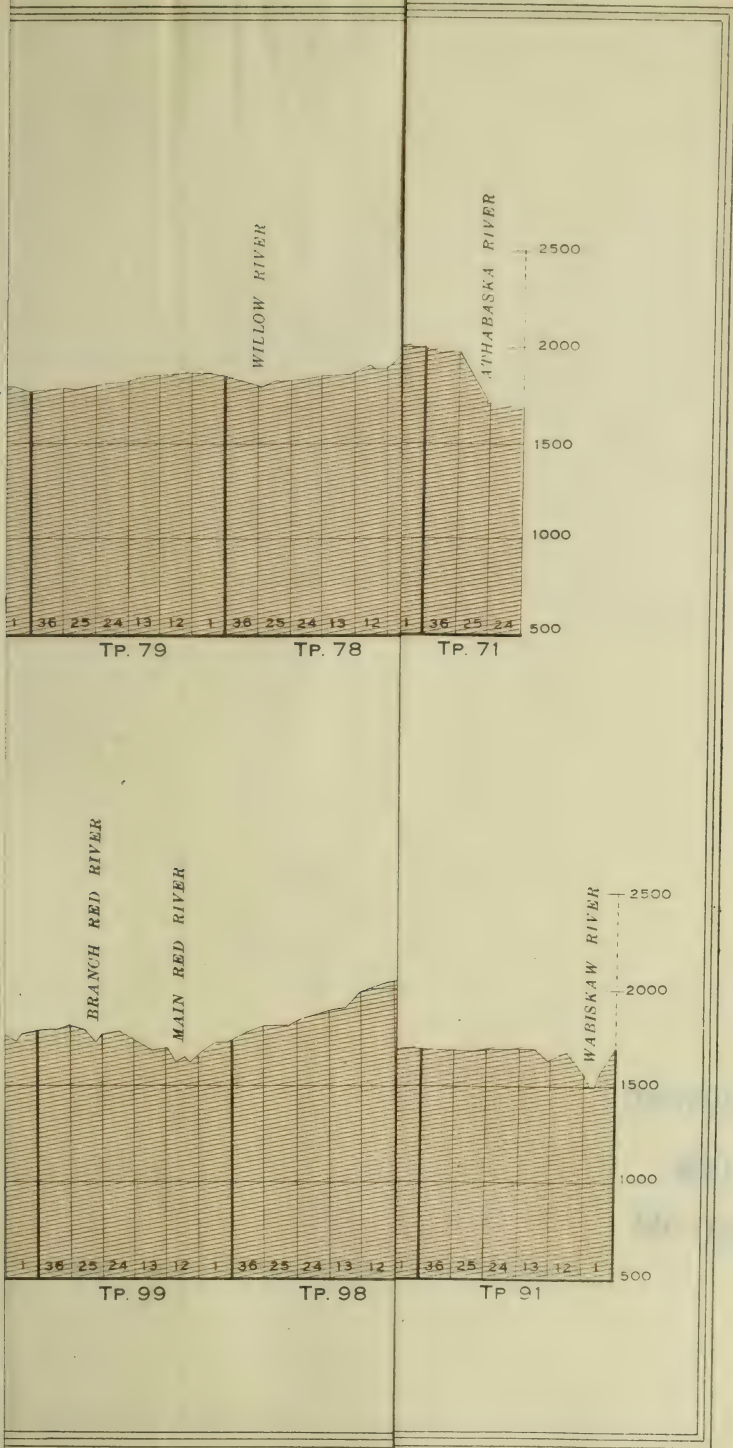
Scale: 6 miles to an inch.



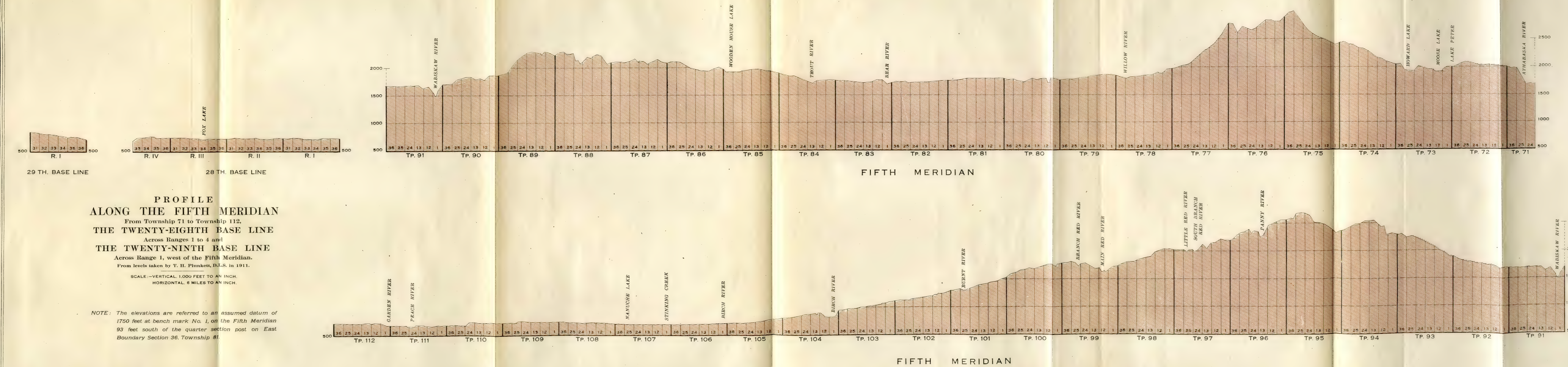
PROFILE  
Vertical Scale: 1000 feet to an inch.  
NOTE: The elevations are referred to an elevation of 1489 feet at bench mark on C. N. R. bridge across the Saskatchewan river at Prince Albert.











**PROFILE  
ALONG THE FIFTH MERIDIAN**  
From Township 71 to Township 112,  
**THE TWENTY-EIGHTH BASE LINE**  
Across Ranges 1 to 4 and  
**THE TWENTY-NINTH BASE LINE**  
Across Range 1, west of the Fifth Meridian.  
From levels taken by T. H. Plunkett, D.L.S. in 1911.  
SCALE:—VERTICAL, 1,000 FEET TO AN INCH.  
HORIZONTAL, 6 MILES TO AN INCH.

NOTE: The elevations are referred to an assumed datum of 1750 feet at bench mark No. 1, on the Fifth Meridian 93 feet south of the quarter section post on East Boundary Section 36, Township 81.



keg

Scale: 6 miles to an inch.





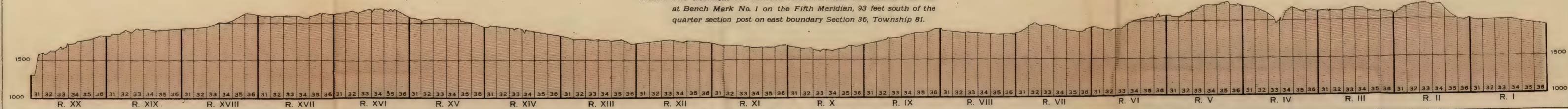
SKETCH MAP OF THE  
TWENTY-SECOND BASE LINE  
Across Ranges 1 to 20  
WEST OF FIFTH MERIDIAN

Scale: 6 miles to an inch.



PROFILE  
Vertical Scale: 1000 feet to an inch.

NOTE: The elevations are referred to an assumed elevation of 1750 feet at Bench Mark No. 1 on the Fifth Meridian, 93 feet south of the quarter section post on east boundary Section 36, Township 81.





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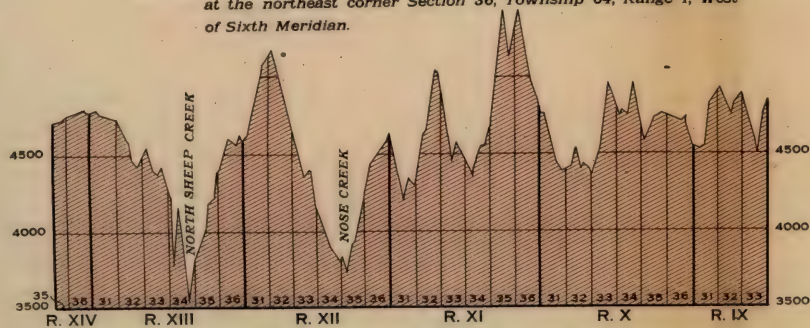
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77.



# PROFILE Vertical Scale : 1000 feet to an inch.

NOTE: The elevations are referred to an assumed elevation of 4000 feet at the northeast corner Section 36, Township 64, Range 1, West of Sixth Meridian.



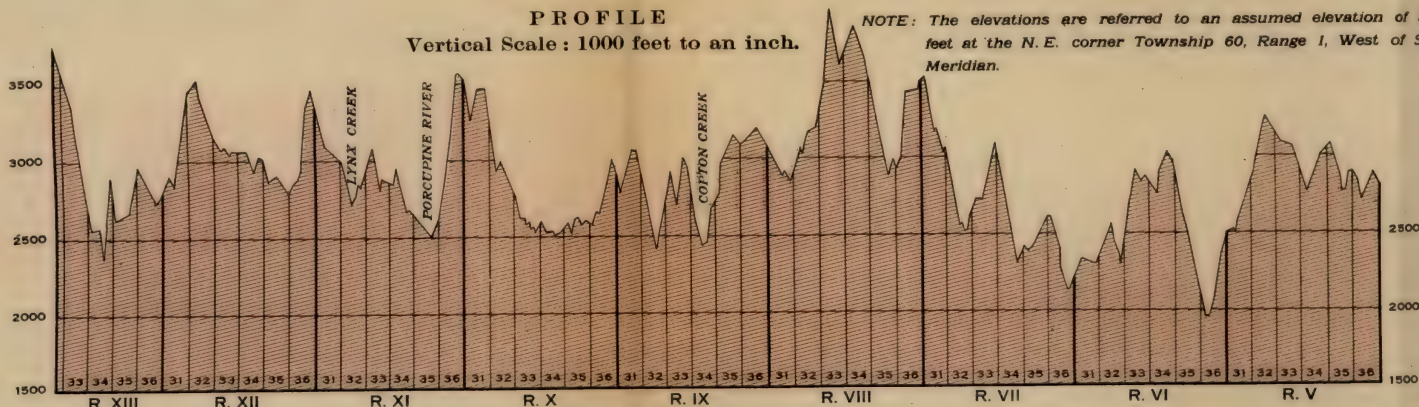
## SKETCH MAP OF THE SIXTEENTH BASE LINE Across Ranges 5 to 13 and THE SEVENTEENTH BASE LINE Across Ranges 9 to 14, WEST OF SIXTH MERIDIAN

Scale: 6 miles to an inch.



# PROFILE Vertical Scale : 1000 feet to an inch.

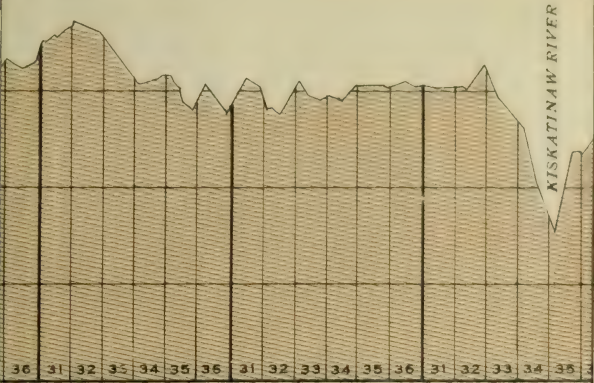
NOTE: The elevations are referred to an assumed elevation of 3000 feet at the N.E. corner Township 60, Range 1, West of Sixth Meridian.



Plat. 14x11 75' 4" = 15.40



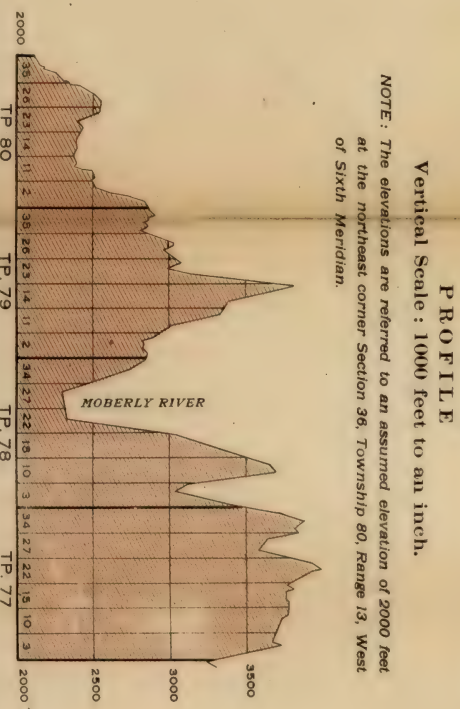
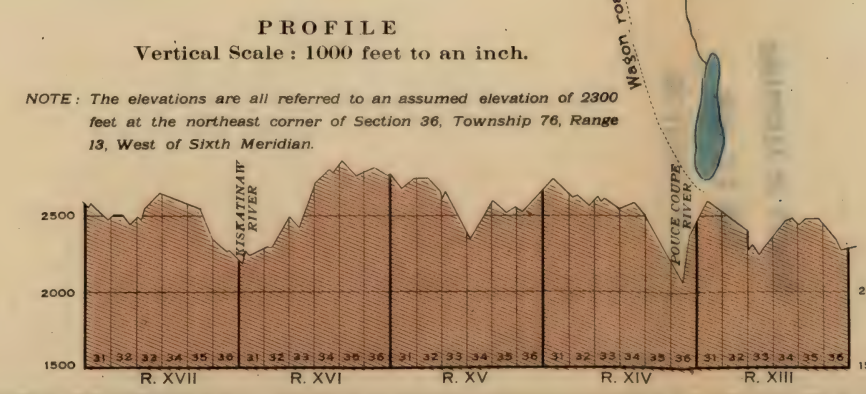
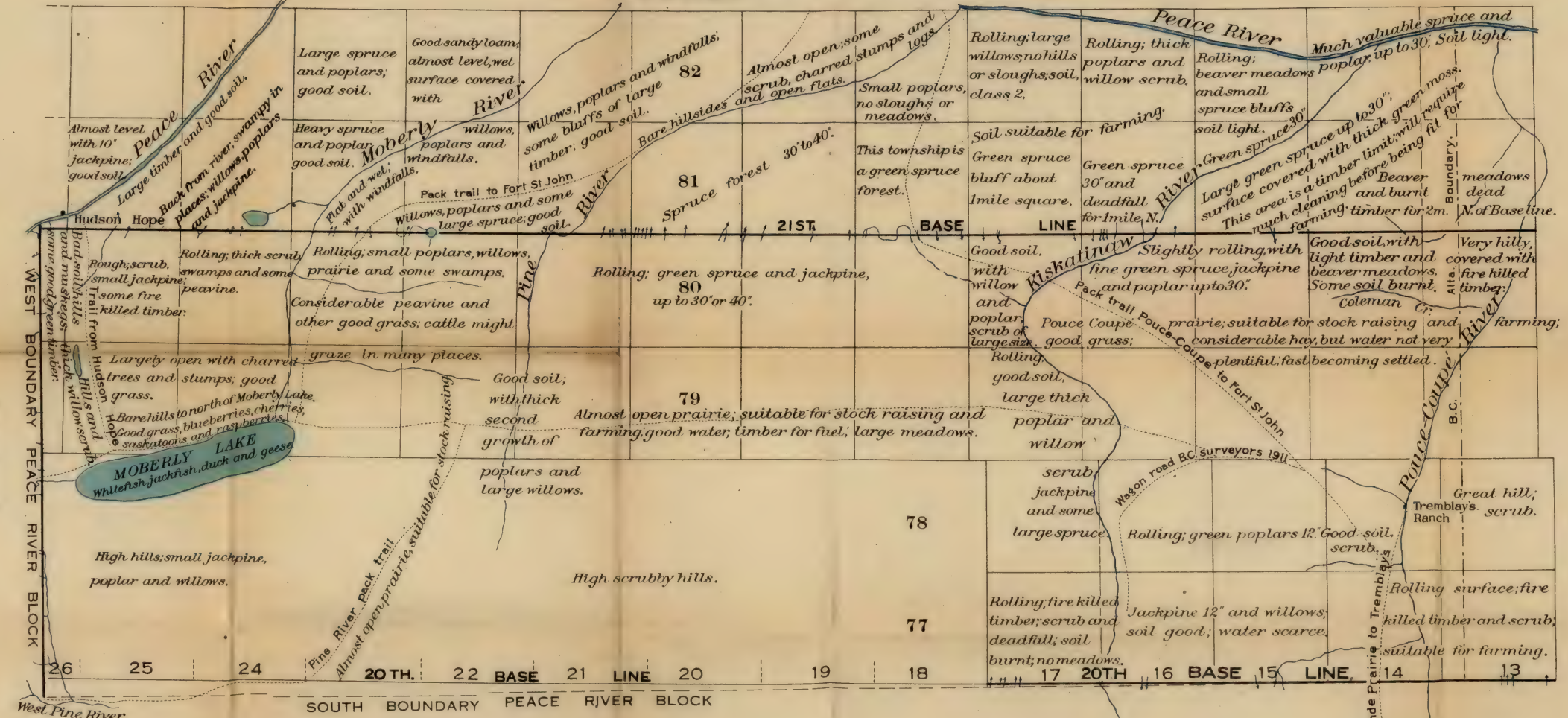
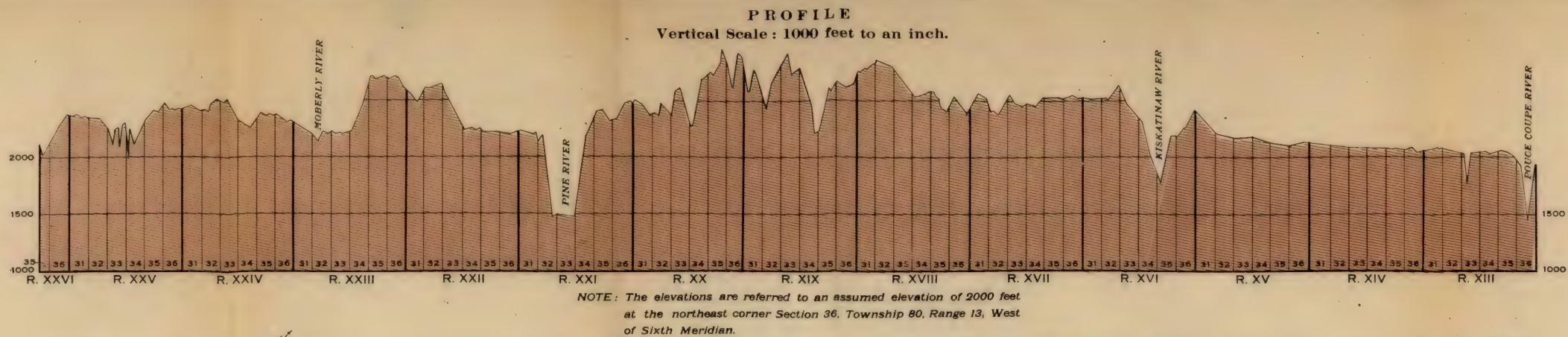
E  
 eet to an inch.



assumed elevation of 2000 feet  
 3, Township 80, Range 13, West

<p><i>Some          ed stumps and          logs.</i></p> <p><i>Small poplars,          no sloughs or          meadows.</i></p>	<p><i>Rolling; large          willows; no hills          or sloughs; soil,          class 2.</i></p>	<p><i>Rolling; thick          poplars and          willow scrub</i></p>
<p><i>This township is</i></p>	<p><i>Soil suitable for farming.</i></p>	

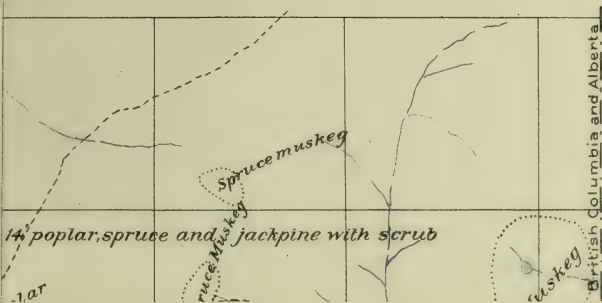




Black 17x15 = 221 - 2210  
Blue 8x13 = 104 - 1040  
3250

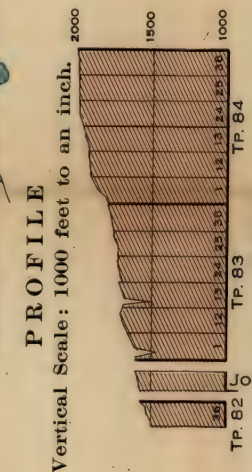


5

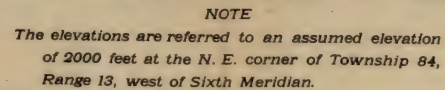




Scale: 6 miles to an inch.



Vertical Scale: 1000 feet to an inch.



20. 16 x 10 = 160 - 16.0

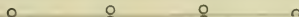
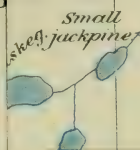


To accompany the report of J. R. Akins, D.L.S.

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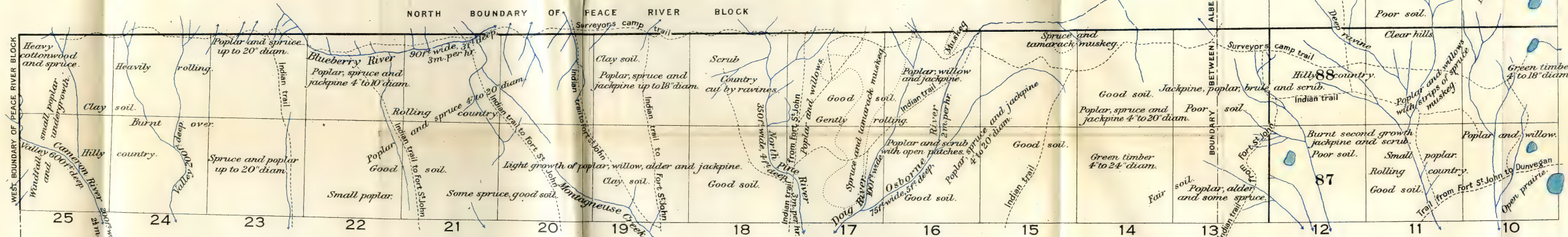
*Small jackpine  
and willow.*





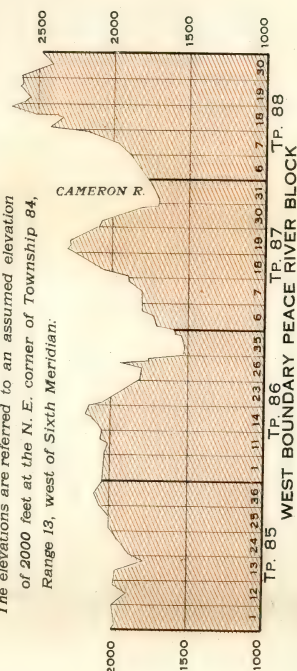
SKETCH MAP  
OF  
THE EAST BOUNDARIES OF TOWNSHIPS 85 TO 88, RANGE 13,  
THE TWENTY-THIRD BASE LINE  
From Range 10 to the west boundary of Alberta,  
THE NORTH BOUNDARY OF PEACE RIVER BLOCK  
AND  
THE WEST BOUNDARY OF PEACE RIVER BLOCK  
From Township 85 to Township 88, west of the Sixth Meridian

Scale: 6 miles to an inch.



PROFILE  
Vertical Scale: 1000 feet to an inch.

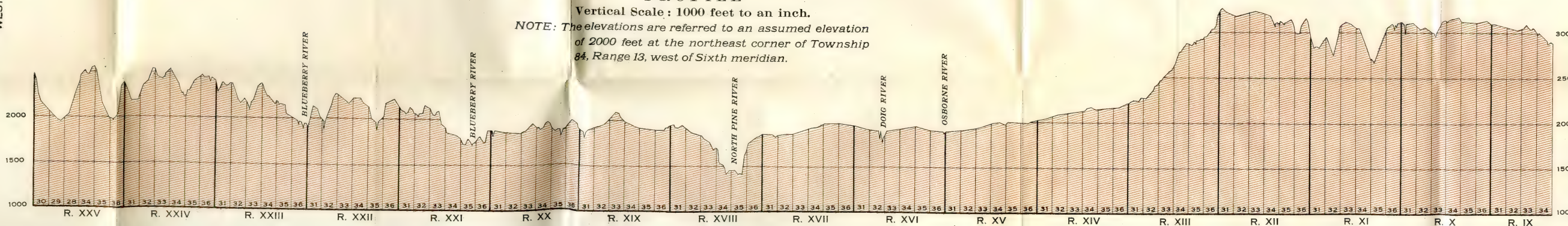
NOTE  
The elevations are referred to an assumed elevation of 2000 feet at the N. E. corner of Township 84, Range 13, west of Sixth Meridian.



PROFILE

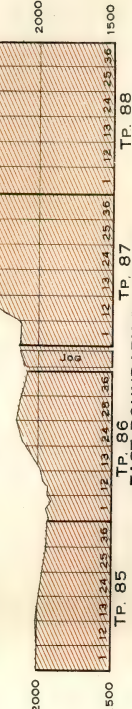
Vertical Scale: 1000 feet to an inch.

NOTE: The elevations are referred to an assumed elevation of 2000 feet at the northeast corner of Township 84, Range 13, west of Sixth meridian.



PROFILE  
Vertical Scale: 1000 feet to an inch.

NOTE  
The elevations are referred to an assumed elevation of 2000 feet at the N. E. corner of Township 84, Range 13, west of Sixth Meridian.



Block 23 x 9 = 207 = 20.70

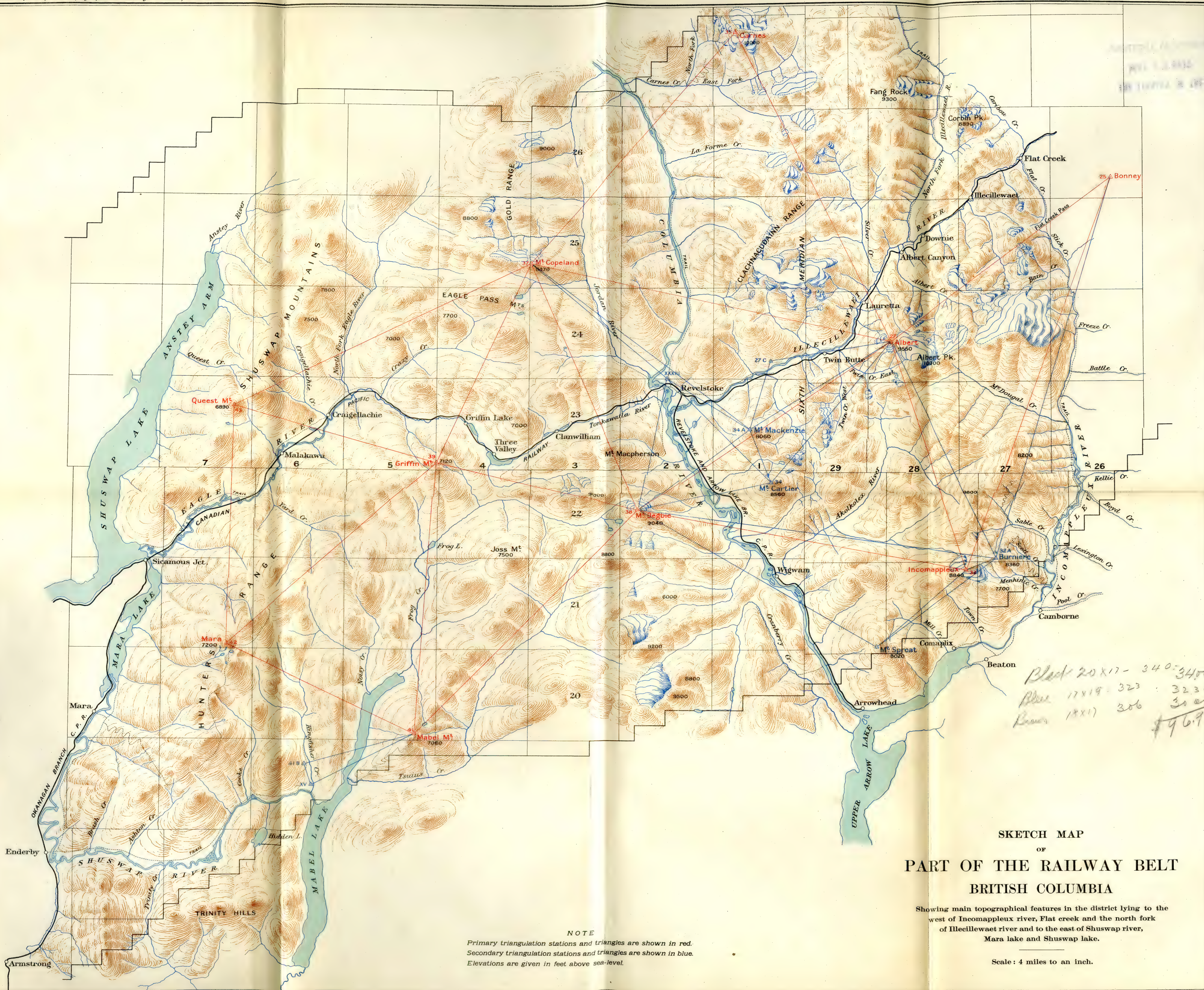


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OUS  
 in this formation, near the mountains interbedded  
 grey to black argillaceous shale, generally friable,  
 MINIFEROUS  
 bluish-weathering, grey limestone, bluish rather  
 at least one band of black carbonaceous shale. The  
 red bluish and grey limestone and brown rather  
 zeous throughout and have numerous cherty bands.  
 YELLOWHEAD M.

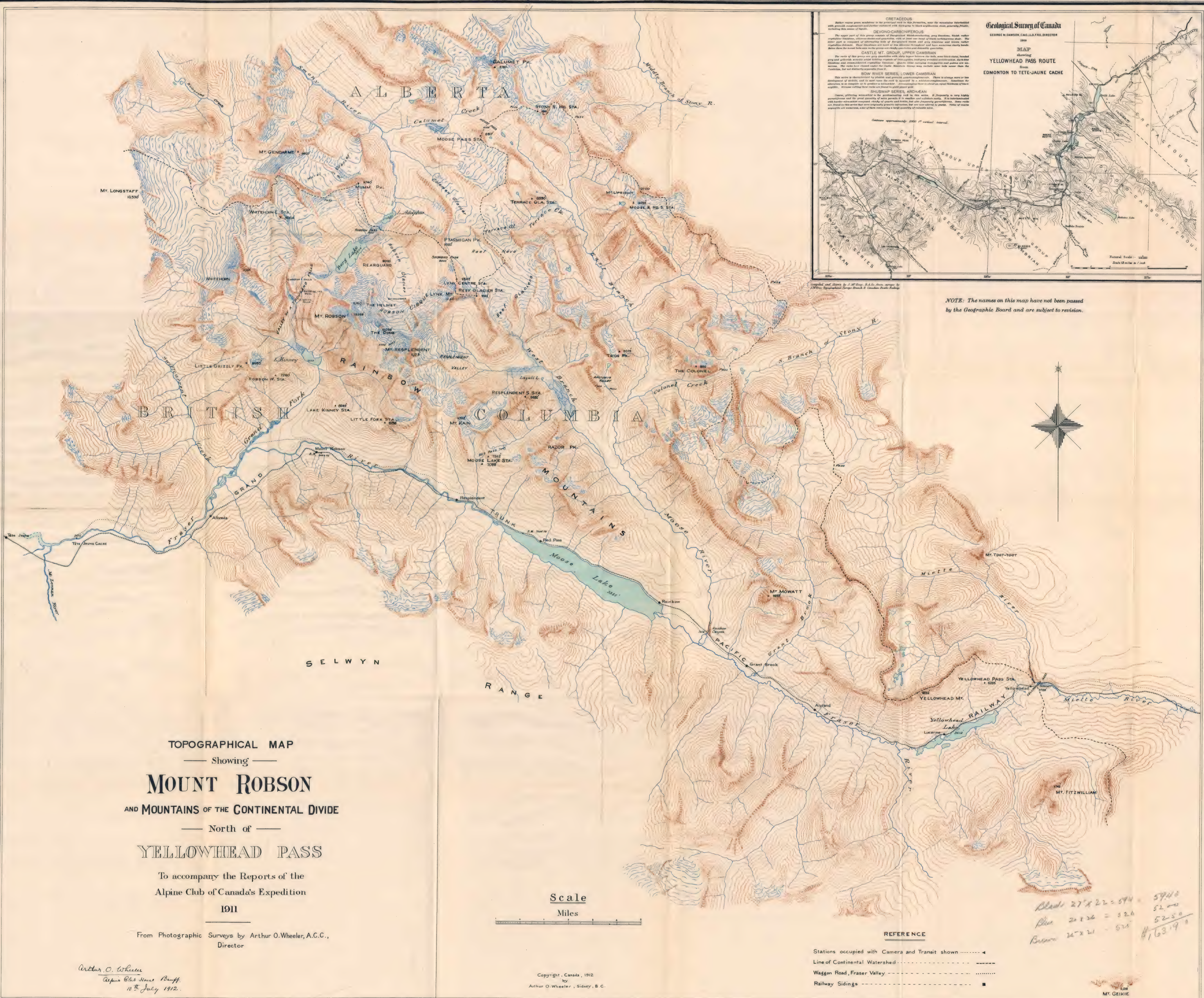
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DEPARTMENT OF THE INTERIOR

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ANNUAL REPORT

OF THE

TOPOGRAPHICAL SURVEYS  
BRANCH

1912-13

*PRINTED BY ORDER OF PARLIAMENT*



OTTAWA

PRINTED BY J. DE L. TACHÉ, PRINTER TO THE KING'S MOST  
EXCELLENT MAJESTY

1914







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# REPORT

## OF THE

# SURVEYOR GENERAL OF DOMINION LANDS

## 1912-13

DEPARTMENT OF THE INTERIOR,  
TOPOGRAPHICAL SURVEYS BRANCH,  
OTTAWA, August 2, 1913.

The Deputy Minister of the Interior,  
Ottawa.

SIR,—I have the honour to submit the following report of the Topographical Surveys Branch for the year ended March 31, 1913.

The surveys in northern Manitoba and the Peace River district were on a larger scale than before. Eighty-two parties were employed, eighty-one of whom were engaged for the whole season, and one for a short period only. The number of parties under daily pay was forty-four, of whom five were for the inspection of contract surveys, ten for the survey of base lines and initial meridians, one for levelling, one for latitude observations, one for triangulation, and the remaining twenty-six for subdivision, resurvey and miscellaneous work of various kinds. Thirty-seven parties were employed under contract on township subdivision.

The following table shows the distribution of parties by provinces:—

Parties.	In Man.	In Sask.	In Alta.	In B.C.	Partly in one Pro- vince and partly in another.	Total.
Paid by the day.....	4	6	16	8	10	44
Under contract.....	10	18	9	.....	.....	37
Parties engaged for a short time only.....	.....	.....	1	.....	.....	1
Totals.....	14	24	26	8	10	82

One hundred and fifty-two whole townships and ten fractional townships were completely subdivided and a partial subdivision was made in four hundred and seventy-five others. Twenty-two whole and two fractional townships were also completely resurveyed and in two hundred and two others portions of the township were resurveyed.

The following statement shows the average number of miles of survey for each party during the last four years:

1909.....	412 miles.
1910.....	279 “
1911.....	280 “
1912.....	266 “



## SURVEY OF BLOCK OUTLINES.

\* Ten surveyors were employed in establishing initial meridians and base lines, and another surveyor retraced the principal meridian. Five of these were located in Alberta, two in Saskatchewan, and three in Manitoba.

Mr. G. H. Herriot, D.L.S., produced the principal meridian north from the sixteenth to the eighteenth base line. This line crosses many bodies of water necessitating much triangulation. In six miles nine channels of Nelson river were crossed. During the summer supplies had to be transported by canoes or man packing, the boggy nature of the district preventing the use of horses.

Parts of the fifteenth, sixteenth and seventeenth base lines west of the principal meridian were run by Mr. O. Rolfson, D.L.S. His report has not yet been received as the field work will not be completed till the end of the present season.

The district through which Mr. E. W. Robinson, D.L.S., produced the second meridian being very wet, the line had to be surveyed in winter. Mr. Robinson has ceased operations, but has not had time yet to prepare his general report.

Mr. T. H. Plunkett, D.L.S., ran portions of the tenth, eleventh, twelfth, thirteenth and fourteenth base lines west of the principal meridian and part of the thirteenth west of the second meridian. The district crossed by these lines is low and very wet. Floating bogs are numerous and water channels scarce, the mossy surface hindering drainage. The slope of the country will, however, be sufficient for drainage when drainage channels are opened.

A portion of the third meridian, from the seventeenth to the eighteenth base line, was established by Mr. A. Saint Cyr, D.L.S. He also surveyed the eighteenth base line from the third to the fourth meridian. The country along the third meridian is so marshy that the roads had to be corduroyed or brushed to bear the weight of the loaded pack ponies. A great part of this boggy land is due to beaver dams which interfere with the natural flow of water. Along the eighteenth base line the land is higher. Stony patches are frequent, and watercourses and lakes are numerous. The surface is mostly wooded, but the timber is not of large size.

The most important industry of the district is fishing which is extensively carried on, the many large bodies of fresh water furnishing enormous quantities of fish from which the companies engaged in this trade obtain a large revenue.

The fourth meridian was produced northerly by Mr. J. B. McFarlane, D.L.S., from the northeast corner of township 105 to lake Athabaska. The country along this portion of the meridian is rolling, with sand hills and small lakes, but north of the twenty-eighth base line muskegs are numerous.

Mr. McFarlane also ran a portion of the twenty-fourth base line west of the fourth meridian.

Mr. Geo. McMillan, D.L.S., surveyed the twentieth base line across ranges 10 to 26 west of the fourth meridian. Good hay and water were found to be abundant. The district is well suited for ranching and access is easy, Athabaska river flowing directly north through it. The surface is densely wooded in Pelican mountains west of the Athabaska, but the timber is too small for milling.

Along the Athabaska there is a strip of dry land, but beyond this rim a muskeg, which had to be corduroyed to carry the pack ponies, extends westerly to the Pelican mountains. Beyond the muskeg, the ground is firm and the surface rolling and hilly.

The nineteenth base from range 5 west of the fourth meridian to the fifth meridian was surveyed by Mr. G. H. Blanchet, D.L.S. The country is similar to that along the base line immediately north which was surveyed by Mr. McMillan, except that the land east of the Athabaska has less muskeg.

Mr. A. H. Hawkins, D.L.S., ran the twenty-third base line from the fifth to the sixth meridian. Access to this work was obtained by sleighs as no summer roads are opened and no water routes are available. Supplies had to be brought in from Edmonton for the eastern portion of the work but for the western part supplies were taken down Peace river.



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Forest fires raged during the survey of this line and the party had some narrow escapes.

Much time was lost on this line going around muskegs which could not be crossed, and progress was also retarded by extensive windfalls, the whole district having been overrun by fire.

The twentieth base line across ranges 18 to 26 and the twenty-third base line across ranges 1 to 8, west of the sixth meridian were run by Mr. J. R. Akins, D.L.S. He also resurveyed a portion of the sixth meridian. The twentieth base line crosses very rough and hilly country, and consequently the work proceeded slowly. This rendered levelling especially difficult, and although many long sights were taken across the deep valleys, trigonometric methods had to be used in many cases.

Along the twenty-third base line the whole country for one hundred miles north of Dunvegan was burnt over, lack of rain in the fall of 1912 being the cause. These forest fires, which in one case had to be fought for three days to save the horses and outfit, destroyed all the grass. The pack train had to travel fourteen miles from camp to secure horse feed when working along the sixth meridian, and when fifteen miles of this line had been run, the work had to be abandoned as no feed was available.

These fires are a source of great danger to survey parties as caches of supplies are frequently destroyed, and unless additional supplies can be readily secured the work has to be abandoned.

## INSPECTION OF CONTRACT SURVEYS.

A chief inspector and five inspectors were employed on the examination of surveys made under contract. The chief inspector was Mr. E. W. Hubbell, D.L.S., and the inspectors, Messrs. P. R. A. Bélanger, D.L.S., C. F. Miles, D.L.S., L. E. Fontaine, D.L.S., G. J. Lonergan, D.L.S., and W. J. Deans, D.L.S.

The work of the inspectors is now more difficult than when the contract surveys were located on prairie or level wooded land. Contracts at present comprise heavily wooded land intersected with marshes which render inspection slower. Access to the work is also a great obstacle and supplies have to be forwarded over roads which are sometimes in bad condition.

Accordingly the inspectors perform very little miscellaneous work and travelling parties consisting of a surveyor and an assistant, with the aid of local labour, have to be employed for such work.

This condition of affairs is likely to continue if surveys are to be kept ahead of settlement and railway construction.

Messrs. Bélanger and Deans inspected the contracts in Manitoba and eastern Saskatchewan, while Messrs. Fontaine, Lonergan and Miles examined the work in Alberta and western Saskatchewan.

## BRITISH COLUMBIA SURVEYS.

Six surveyors were employed on work in the railway belt of British Columbia.

Mr. J. A. Calder, D.L.S., surveyed lands in the Thomson and Nicola valleys in the vicinity of Spence's Bridge, and also near Walhachin. The portions surveyed are well adapted for fruit raising, though irrigation is necessary to secure good results.

Mr. A. Lighthall, D.L.S., retraced the townsite of Langley, ran traverses and took levels at Woodhaven, and performed several miscellaneous subdivision surveys. He also surveyed the outlines of timber berths along the North Arm of Burrard Inlet, and Pitt lake.

Some subdivisions around Kamloops was done by Mr. C. H. Taggart, D.L.S. He also established a portion of the outline of the railway belt west of Adams lake. This outline is very rough and thickly wooded, the ground in places being covered with heavy windfall.

Mr. N. C. Stewart, D.L.S., carried on subdivision in the vicinity of Enderby, Golden and Moberly, and surveyed the townsite of Rogers Pass in township 27, range 25 west of the fifth meridian.



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Subdivision surveys were made by Mr. P. Melhuish, D.L.S., in the vicinity of Keefers and Spuzzum. He also surveyed a timber berth at the latter place.

Mr. A. V. Chase, D.L.S., continued the examination of vacant lands in the Kamloops district.

#### TOWNSHIP SUBDIVISION SURVEYS.

Most of the subdivision surveys were performed under contract, but in some cases the surveys were made by daily paid surveyors, as the work was of such a nature that it could not be done at contract rates.

Mr. E. W. Berry, D.L.S., subdivided lands along the Hudson Bay railway near Le Pas, which were wanted for settlement.

Mr. P. B. Street, D.L.S., surveyed in the foot-hills in southeastern Alberta and Mr. E. S. Martindale, D.L.S., worked farther north in the foot-hills, about fifty miles southwest of Calgary.

Subdivision near the Yellowhead Pass was done by Mr. C. A. Grassie, D.L.S. The land subdivided lies along the line of the Canadian Northern railway within the Jasper Forest Park reserve.

In the Brazeau district, Mr. A. L. McNaughton, D.L.S., subdivided lands on which coal claims had been staked out.

Mr. L. Brenot, D.L.S., subdivided land on the upper Peace river in the vicinity of Hudson Hope and Fort St. John settlements.

The most isolated surveys were those of Mr. J. S. Galletly, D.L.S., in the Vermilion district, over 150 miles north of Peace River Crossing. Some first-class farming land in the valley of Peace river was subdivided and settlers who had been in the district for some time had the boundaries of their homesteads properly defined.

#### CORRECTION, RESTORATION AND MISCELLANEOUS SURVEYS.

Mr. A. G. Stuart, D.L.S., retraced about one hundred and seventy miles of the principal meridian north from the international boundary. This work was necessary to locate an error of 26.49 chains in township 35. It was found that the discrepancy was due to the use of incorrect chains by the surveyors who ran the line in 1871. Mr. Stuart did some traverse and correction surveys in Manitoba, and retracement and resurvey work was carried on in the same province by Mr. C. F. Aylsworth, D.L.S.

In Saskatchewan, Messrs. C. Rinfret, D.L.S., and S. L. Evans, D.L.S., worked on miscellaneous resurveys, retracement and restoration surveys, and the same class of work was attended to in Alberta by Messrs. J. A. Calder, D.L.S., and G. A. Cowper, D.L.S.

Four travelling parties were employed to carry on miscellaneous small surveys, and investigate errors, drying up of lakes, lost monuments, etc. Local assistance was procured when necessary, and as the work for the most part was in settled or partly settled districts no camp equipment was necessary. Messrs. G. A. Bennett, D.L.S., R. C. Purser, D.L.S., F. V. Seibert, D.L.S., and B. H. Segre, D.L.S., were surveyors in charge of the travelling parties.

Mr. M. P. Bridgland, D.L.S., continued the triangulation work in the railway belt of British Columbia.

A base line about five miles long was measured at Salmon Arm with the invar wire base apparatus. Great precision was required in the measurement, the location of all triangulation stations in the vicinity being determined from this base. Mr. Bridgland also surveyed some villa lots at Banff.

The topographical survey in the Fiddle Creek district in the Jasper Forest Park Reserve was continued by Mr. H. Matheson, D.L.S. The principal work consisted in locating a road along Fiddle Creek canyon from the Grand Trunk Pacific station



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to Miette Hot Springs, about eleven miles distant. The district is so rough and mountainous and the sides of the canyon so precipitous that much contour work was necessary and progress was slow.

Mr. J. A. Fletcher, D.L.S., took latitude observations on the second, third and fifth meridians and also in the railway belt of British Columbia.

The surveys of isolated settlements along Athabaska river were performed by Mr. E. A. Neville, D.L.S. Surveys were made at Chipewyan, Smith Landing and Fort Smith.

Mr. C. M. Walker, D.L.S., retraced two townships south of Medicine Hat. He also made a restoration survey of the townsite and villa lots at Banff, extended the townsite and surveyed the roads constructed around Banff, &c. The work at Banff was done for the Dominion Parks Branch, and was urgently required as applications for lots had to be withheld till the survey was completed.

Mr. L. F. Heuperman, D.L.S., who was employed for a short time only, did some subdivision northeast of Macleod.

## STATEMENT OF MILEAGE SURVEYED.

The following is a comparison of the mileage surveyed each year since 1910:—

Nature of Survey.	April 1, 1910 to March 31, 1911.	April 1, 1911 to March 31, 1912.	April 1, 1912 to March 31, 1913.
	Miles.	Miles.	Miles.
Township outlines. ....	2,376	2,041	2,718
Section lines. ....	11,849	10,098	10,365
Traverse. ....	2,758	2,577	3,509
Resurvey. ....	906	2,317	2,586
Total for season. ....	17,889	17,033	19,178
Number of parties. ....	64	61	72
Average miles per party. ....	279	280	266

The following tables show the mileage surveyed by the parties under daily pay and by the parties under contract:—

## WORK OF PARTIES UNDER DAILY PAY.

Nature of Survey.	April 1, 1910 to March 31, 1911.	April 1, 1911 to March 31, 1912.	April 1, 1912 to March 31, 1913
	Miles.	Miles.	Miles.
Township outlines. ....	1,178	992	1,619
Section lines. ....	1,487	823	1,358
Traverse. ....	462	498	992
Resurvey. ....	835	2,237	2,538
Total for season. ....	3,962	4,550	6,507
Number of parties. ....	30	29	35
Average miles per party. ....	132	157	186



## WORK OF PARTIES UNDER CONTRACT.

Nature of Survey.	April 1, 1910 to March 31, 1911.	April 1, 1911 to March 31, 1912.	April 1, 1912 to March 31, 1913.
	Miles.	Miles.	Miles.
Township outlines.....	1,198	1,049	1,099
Section lines.....	10,362	9,275	9,007
Traverse.....	2,296	2,079	2,517
Resurvey.....	71	80	48
Total for season.....	13,927	12,483	12,671
Number of parties.....	34	32	37
Average miles per party.....	410	390	342

Owing to the nature of their work, ten parties are not included in the statement of mileage for the year ended March 31, 1913.

## COST OF SURVEYS.

The following statement shows the average cost per mile of surveys executed by surveyors under daily pay and by surveyors under contract:—

	Surveyed under daily pay.	Surveyed under contract.
Total mileage surveyed.....	6,507	12,671
Total cost.....	\$455,780	\$325,882
Average cost per mile.....	\$70.05	\$25.72

## STANDARDS OF LENGTH.

The business of a land surveyor being to measure land, the first requisite of his profession is a correct measure. In the early days of Canada every surveyor upon receiving his commission was furnished by the Secretary of the Board of Examiners with a wooden yard by means of which he was directed to verify his chains. The length of a wooden rod is affected by moisture, heat and other causes; even if the length were correct, the accurate verification of a surveyor's chain by means of a yard requires elaborate apparatus and installations not usually at the disposal of surveyors. Such tests as a surveyor is able to make with a yard are suitable only for measurements of a rough character. One of my first acts in assuming the direction of Dominion Lands Surveys over thirty years ago, was to recommend the substitution of an adequate Standard of length, properly tested, in the place of the wooden yard Standard. I never ceased to urge the great importance and absolute necessity of this reform and I am glad to say that in a few months it will at last be accomplished. An account of the steps taken in endeavouring to obtain this reform is set forth in a resolution adopted by the Board of Examiners for D.L.S., on March 7, 1905. It is as follows:—

‘Prior to 1886, the Dominion Lands Act required every Dominion Land surveyor to be in possession of a standard measure of length which was to be furnished to him



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by the Department of Inland Revenue on payment of three dollars. The Standards, which were three feet pine rods, were of little or no use to surveyors and as no penalty was provided by the Act, few surveyors, if any, procured them.

In 1885, the Board of Examiners for Dominion Land Surveyors, impressed with the necessity of supplying adequate standard measures to surveyors, recommended that a line measure consisting of a 66 feet steel band be substituted in the place of the 3-feet wooden rod and that the Act be amended to provide that such measure should be furnished to surveyors by the Secretary of the Board, after being tested and stamped by the Department of Inland Revenue. A penalty of twelve months suspension was suggested for surveyors not complying with the law. These amendments were adopted by Parliament during the session of 1885-86 and assented to in June, 1886. The steel bands were immediately procured and the Board of Examiners deputed one of its members, Mr. W. F. King, to ascertain whether the Department of Inland Revenue had a suitable comparator for testing such measures. Mr. King interviewed Mr. Miall, Commissioner of Inland Revenue, who referred him to Mr. Johnstone, Chief Inspector of Weights and Measures. Mr. King was shown a comparator for testing end measures: he pointed out that it was not suitable for testing line measures such as those to be furnished to surveyors, and asked whether another comparator could be set up. Mr. Johnstone's reply was in the negative. It appeared from the conversation that the Department of Inland Revenue had for some time been asking a special building for their standards but so far had not succeeded in having it provided for in the estimates. When they obtained such a building, they would provide a suitable comparator, but not before. Thereupon, the board adopted a resolution recommending that the law be amended so as to place the testing of these measures under their own control and that the purchase of a comparator be authorized. Before acting upon this resolution, the Deputy Minister of the Interior communicated with the Commissioner of Inland Revenue and was informed that the comparator would be procured and set up.

Then followed a period of five years during which the Department of Inland Revenue alternately refused and agreed to set up the comparator until it was finally set up in 1891. The plans had been furnished by the Surveyor General, but the workmanship was so rough that the tests were never satisfactory. However, it was used for some years, one hundred and thirty-five measures being tested and issued to surveyors.

The uncertainty of measurements under these conditions may be illustrated by the experience of Mr. A. O. Wheeler, one of the surveyors of the Department of the Interior, with a 100 metres tape. A test of this tape was furnished by the manufacturers, Messrs. Keuffel & Esser, of New York, and another test by the United States Coast and Geodetic Survey. It was also compared with Mr. Wheeler's subsidiary standard which had been tested once by the Department of Inland Revenue and twice by this Board. The five comparisons reduced to the same temperature and tension show the tape to be too long as follows:—

Keuffel & Esser. . . . .	0.194 inch.
U. S. Coast and Geodetic Survey. . . . .	0.946 "
Department of Inland Revenue. . . . .	1.498 "
Board of Examiners for D.L.S., first test. . . . .	2.073 "
Board of Examiners for D.L.S., second test. . . . .	2.307 "

The above figures show an uncertainty of over two inches in the length of this tape, equivalent to about three feet per mile. How unsatisfactory this is may be understood when it is stated that on well equipped comparators tests are now made with a precision equivalent to one or two-tenths of an inch per mile. Such an extreme precision is not required by surveyors in the ordinary practice of their



profession, but it is not unreasonable to ask for them an accuracy of one-fiftieth of an inch for a 66 feet tape, which is equivalent to 1.6 inches per mile.

A rough wooden shed for the comparator had been put up on an ordnance lot on Cliff street. The door was closed with a cheap padlock and light given through a few small windows without shutters. In 1902, or thereabouts, the place was entered by boys who broke the windows, stole seven steel bands and parts of the comparator, broke the thermometers and left everything in confusion. It was stated by the Deputy Minister of Inland Revenue that steps would be taken to replace the missing parts and to put the comparator in proper shape again but this has not yet been done and the tests of the measures furnished to surveyors since 1901 are not, in the opinion of the Board, sufficiently accurate to meet the requirements of the profession. The Surveyor General interviewed recently the Chief Inspector of Weights and Measures and was informed that the comparator on Cliff street would not be repaired but that one would be placed in a building to be erected for the standards. In the meantime, the measures would be tested on a mural standard back of the Langevin Block.

It is thus seen that we have come back to the point we started from nineteen years ago: the present Chief Inspector states, as Mr. Johnstone did then, that a suitable comparator will be provided when a building is erected for the standards. The Board is of the opinion that such a condition of affairs should not be allowed to continue any longer and that steps should be taken immediately to furnish to surveyors measures tested with sufficient precision for the purpose of their profession. After full consideration and discussion, the Board have come to the conclusion that the matter will not be properly attended to until it is placed under their control: therefore they recommend that the Dominion Lands Act be amended accordingly and that authority be granted for the establishment of a suitable comparator.'

The Chief Inspector of Weights and Measures was quite right in declining to test our measures until a building was provided. Control of the temperature is essential for proper tests; its variations must be extremely slow. This requires a substantial building; without it the accuracy of the tests would have been illusory.

The amendment to the law was not made until March, 1908, when the Dominion Lands Surveys Act was assented to. Section 35 of the Act directs the Surveyor General to furnish standard measures to surveyors and to make the necessary tests of these standards.

The next thing to be done was to erect a building for the installation of the testing apparatus so that the directions of the law could be carried out. Provision for the erection of the building was made in the estimates for several years in succession, but it was not commenced until last year. It is nearly finished. It is expected that the comparator will be installed and measures tested before the end of the summer.

The comparator was designed under the direction and according to the indications of Mr. Chas. Ed. Guillaume, Assistant Director of the International Bureau of Weights and Measures, who is probably the greatest living authority on questions relating to the measurement of lengths.

The plans were made and the apparatus constructed by the 'Société Genevoise pour la Construction d'Instruments de Physique et de Mécanique,' a firm which has made a specialty of this kind of apparatus. The comparator consists of a four metres invar rule divided into millimetres, borne by a carriage which moves upon rails opposite reference marks attached to concrete piers. The length, of the base, 32 metres, is sufficient for testing directly English measures up to 100 feet. The section of the invar rule, something like the letter 'h,' is entirely new. The apparatus, which is very elaborate, is provided with all the appliances necessary for convenience in handling and accuracy in results. The thanks of the Department are due to Mr. Guillaume for devising the apparatus, directing its construction, standardizing the invar rule, testing



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and calculating tables of corrections for the precision thermometers, and helping us in many other ways.

The new subsidiary standard is a steel tape one-quarter inch wide, 0.012 inch thick and a little over 66 feet in length. On one side, at every ten links, one-tenth of a link is divided into hundredths and half hundredths. On the other side, at every ten feet up to 50 feet, one-tenth of a foot is divided into hundredths and fifths of a hundredth. The graduations, which are engraved, are very fine. A tension handle is provided for applying the tension of 10 pounds under which the tape is tested and certified. The standard is made by the Lufkin Rule Company of Canada; its perfection and accuracy are remarkable. The company fully realize the need and importance of an accurate standard; the surveying profession is indebted to them for their hearty co-operation in producing it.

## ERRORS IN DOMINION LANDS SURVEYS.

Nearly nine-tenths of the existing surveys have been executed under my direction. When I took charge, the subdivision surveys had barely crossed the western limit of Manitoba; they now spread from Ontario to the Pacific Ocean and to township 110 in the north.

Under the provisions of the first Dominion Lands Act, a quarter section was held to contain 160 acres, whatever might be the actual contents. It followed that a section side was held to be one mile in length and was so returned by the surveyors. Four directions, no more, were admitted for section or township lines and entered by surveyors in their field notes, namely, north, south, east and west. Although the law has been changed on my recommendation and surveyors now return in their field notes what they actually find, the principle of the old law was sound. It makes absolutely no difference to a farmer whether his quarter section contains 159 or 161 acres; by calling the area 160 acres and the section side one mile, a great simplification was introduced in all land transactions. Evidently, the Surveyor General, Col. Dennis, when drafting the first Dominion Land Act, expected that the discrepancies of the survey could be kept within narrow limits and that is where the principle failed. As time went on, we heard of discrepancies sometimes exceeding a quarter of a mile, where, according to the surveyor's field notes, everything was perfectly regular. These errors appear to be spread all over Manitoba. In extending the surveys west of Manitoba, discrepancies of a like nature, although on a smaller scale, were met with; they were located and corrected by astronomical observations. Measuring on the earth by means of the stars is a roundabout way of finding distances and not a very accurate one, but it was the best we could do. We thus managed to keep errors within bounds outside of Manitoba. On reaching Peace river, we were a quarter of a mile out, but Peace river is a long way off; the error was corrected later. So far as we are able to judge, and with the exception of lower Peace river, which has not been checked, few if any township lines outside of Manitoba are more than 200 feet out of position.

For a long time, the condition of affairs in Manitoba was utterly incomprehensible; errors would crop up in the most unexpected places. In starting from a township corner and steering for the next one, we were never sure we would hit it or anywhere near it. The field notes of the old surveys, in which the entries were often purely conventional, afforded very little assistance. The trouble was attributed to the carelessness and incompetence of early surveyors, but even if it had been understood it was too late for making corrections, because the lands had been taken up and their boundaries could not be changed. The climax happened when the principal meridian was produced northerly across lake Winnipeg for the purpose of surveying lands along the Hudson Bay railway; it was found by astronomical observations that township 35 was one-third of a mile too far north. A connected system of survey could not be carried out with errors of this magnitude in the short space of 35 townships,



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and so it was decided to find out what the trouble was by going over the old lines right from the beginning. This was done last year by Mr. A. G. Stuart, who retraced the principal meridian from the international boundary to township 28. Then came the astonishing discovery that the errors were mostly due to the use of incorrect measures. The old surveyors were not to blame, but their chains were wrong and this was because the means of verification furnished to them were inadequate. The evidence is incontrovertible. Milner Hart, for instance, in laying out fifteen townships in 1871 made all his miles within a few links of the same length, which is proof of careful chaining, but every mile is 13 feet too long, which shows that his chain was two inches too long. It may be asked how it could possibly be so much in error. If Milner Hart verified his chain by stretching it on the prairie and measuring it with the wooden yard, furnished to him as a standard, the error on each yard length was less than one-tenth of an inch and is perhaps not more than was to be expected under the circumstances and with such rudimentary means of verification. If the measurements had been continued with that same chain up to Peace river or the Pacific Ocean, the township lines would have been nearly three miles out of position. If all the chains had been equally wrong, there would have been no difficulty; the townships and sections would have been square and all of equal size, without gap or overlap anywhere. But the chains were of various lengths; there were even some that were correct. The conditions can now be easily understood. Between the lines run westerly from the principal meridian and those run easterly from the second meridian upon which lengths are about correct, there is a gap which varies all the way from a few chains to 26 chains. This is not all; the base lines running east and west are affected by the same causes as the meridians and produce another set of discrepancies. The result of the whole is inextricable confusion.

It is unfortunate that surveyors were not at the outset provided with adequate means of verifying their chains. If lengths had been correctly measured, the land survey of the Dominion would have been the most perfect and remarkable one in the world. 4

## CORRESPONDENCE.

The correspondence of this Branch consisted of:—

Letters received. . . . .	12,598
Letters sent. . . . .	16,600

## ACCOUNTS.

Number of accounts dealt with. . . . .	1,280
Amount of accounts. . . . .	\$976,436
Number of cheques forwarded. . . . .	3,630

## CHIEF DRAUGHTSMAN'S OFFICE.

(*T. Shanks, Chief Draughtsman.*)

In last year's report reference was made to the difficulty of carrying on efficient work owing to the many changes in the staff. As a result of these changes the unsatisfactory condition of the technical staff deserves serious consideration. It is becoming more difficult every year to have the office work attended to and it is falling in arrears. Only the immediate demands of the public can be dealt with under present conditions and even these cannot in many cases be given the consideration they deserve. It follows that much interesting and valuable information collected at great cost by the



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surveyors cannot be made available for the public because we have not enough employees to compile it from the reports and field notes. Unless some measure of relief is obtained soon, the situation will get beyond control.

The technical staff consists of 93 men, or rather should consist of 93 men if all the vacancies were filled, but appointments cannot be made fast enough to fill the places of those who are leaving to do better elsewhere and who, as a rule are the most useful and efficient of our men. Many of the nominees of the Civil Service Commission after becoming aware of the prospects offered, decline the appointment. Others stay a few months and resign or are transferred to other offices.

In the past, applicants for positions in the office have been selected in most cases from graduates of recognized universities, preference being given to men who have some special training in mathematics or engineering. During the last few years we have not been able to induce a sufficient number of competent men to accept employment or to remain in the service after appointment. Since May 1, 1910, the Civil Service Commission has been asked for the appointment of 65 technical clerks. From the applications received, 71 men with the required qualifications were selected but only 58 reported for duty and of these only 31 are at present on the staff. The fact that we are not able to obtain a sufficient number of qualified men to fill vacancies shows that the initial inducements are not attractive enough and the fact that we cannot retain the men who are appointed proves that the prospects for advancement are not to be compared with those of similar positions outside our service.

The duties of the technical staff may be classified under four heads, viz.:

1. Drafting instructions to surveyors.
2. Checking the work of surveyors, pointing out their mistakes and the corrections required.
3. Plotting the surveys and issuing the plans.
4. Furnishing technical information to other Departments and to the public.

The technical employee must be at least as well qualified as the surveyor if he is to tell the latter how his survey is to be made, but while the surveyor is paid at the rate of \$3,100 to \$4,500 a year, the technical employee is appointed at \$1,200 a year with very remote prospects of ever advancing beyond \$1,600. That the surveyors are not paid too much is proved by the fact that the number of recruits is barely sufficient for the needs of the service. In the West, the regular salary of a provincial land surveyor is fifteen dollars per day. The disproportion in the remuneration of the technical employee, who is fully as well qualified as the surveyor, explains why his services cannot be retained.

The consequences of this policy are manifold. A surveyor may be waiting for instructions because no competent employee is available to draft them; it would be cheaper to pay a fair salary to an employee than to keep a whole survey party idle. Or it may be that some plotting or other work has to be done before the survey can be proceeded with. If done by the surveyor while his party is waiting, it will cost \$40 to \$75 per day according to the size of the party. It could be done here by an employee at five or six dollars per day, but to have it done at \$3.50 per day is a hopeless task. Many instances could be cited where the present organization of the staff is a cause of great waste, but the worst feature is the baneful effect on the surveys administration generally.

As the past decade has been one of remarkable activity in western Canada, the surveys of Dominion Lands have had to keep pace with the rapid progress in settlement and industrial development. To lay out the land ahead of the homesteader, the miner and the lumbermen has necessitated the organization of a large field staff, directed from the head office. This meant constantly keeping in touch with a widely scattered corps of surveyors, furnishing them with detailed instructions for their work and examining their field notes to see that the surveys were satisfactorily made.



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The magnitude of this work may be judged from the following statement showing the number of surveyors employed for the past ten years:

Year.	On day pay.	On Contract.	Total number of surveyors employed.
1903.....	16	53	69
1904.....	25	57	82
1905.....	29	20	49
1906.....	35	29	64
1907.....	33	30	63
1908.....	39	31	70
1909.....	38	26	64
1910.....	39	34	73
1911.....	41	33	74
1912.....	44	37	81
Total.....	339	350	689
Average.....	34	35	69

While the extent of the surveys performed is a fair indication of the amount of office work for the year, it cannot be accepted as an accurate guide. The problems of survey work grow in complexity as settlement increases and this is true not only of field work but of questions of office administration. The surveys of early years were confined to township subdivision on the prairie. The instructions were simple, the work in many cases was performed by men who possessed neither lengthy experience nor special technical knowledge and the examination of the notes and plans was made with little attention to detail. As a result of settlement and the consequent increase in the value of the land, many things that were overlooked in the surveys of thirty and forty years ago have come to light. These frequently lead to disputes among settlers and to much investigation on the part of the Department and the errors are often difficult and sometimes impossible to correct. The law provides for corrections under certain conditions and an attempt is made to remove the trouble in every case where there is a possibility of this being done.

Among the other phases of work which have developed during recent years may be mentioned the growing demand for special settlement and townsite surveys, the greater attention given to exploratory and purely topographical work, the examination of railway and highway plans and the constantly increasing correspondence with the public and with surveyors in private or provincial practice who depend upon this office to furnish information about surveys already made. The research work entailed in collecting data from old survey records is not always easy and is further complicated by the fact that the offices of the Department are not accommodated in one building.

#### FIRST SECTION—SURVEY INSTRUCTIONS AND GENERAL INFORMATION.

*(H. G. Barber, Chief of Section.)*

The work performed in this section consists, in general, of the preparation of instructions for the surveyors in the field, the entering of all survey returns in the various registers, the issuing of all preliminary plans except for the townships in the railway belt of British Columbia, the issuing of the Annual Report of the Branch, and the answering of requests for information received from the general public and from other Branches and Departments.

Two hundred and fifty-five drafts of instructions were issued involving the preparation of 2,019 sketches and 253 maps and tracings.



## SESSIONAL PAPER No. 25b

One thousand four hundred and fifteen communications from settlers and others and inquiries from other Branches and Departments were dealt with. This necessitated the preparation of 1,830 sketches, 181 plans and tracings and 368 pages of field notes. Two thousand and twenty-nine copies of sketches were also made for the information of other Branches.

Preliminary plans were issued for 232 townships. Four copies of each are prepared, one copy being placed on file in this office, and one each being furnished to the Survey Records Branch, the Land Patents Branch, and the land agent in whose district the township lies.

Plans of 517 townships and 9 townsites and settlements were received from the lithographic office as well as 84 sectional maps and 153 miscellaneous plans.

The office registers show that there were received from the surveyors in the field, 1,372 progress sketches, 336 books of field notes for township surveys, 299 books and 254 plans for miscellaneous surveys, 210 timber reports, 176 statutory declarations, and returns for 73 magnetic observations and for 13 timber berths. General reports on their survey operations were received from forty surveyors.

Their examination being completed, 431 field books of township surveys and 52 books and 138 plans of miscellaneous surveys were placed on record.

The number of files received from the Correspondence Branch for use in the work of the office was 1,845.

The total number of draft letters and memoranda was 6,322.

The preparation of the new edition of the Manual of Instructions for the survey of Dominion Lands was completed during the year. It is now in the hands of the printers and it is expected that it will be issued shortly.

A new edition of the pamphlet entitled 'Description of the surveyed townships in the Peace River district in the provinces of Alberta and British Columbia' has just been prepared. It is now ready for the printers and is expected to be ready for distribution in a couple of months.

A new feature of the work of the section was the preparation of topographical maps of Banff, Woodhaven and Fitzhugh townsites and of Bankhead cemetery on which schemes of subdivision were laid down and from which working plans for the surveyor were prepared. This involved a large amount of work requiring the full time of three draughtsmen for about three and one-half months. The plans for Bankhead cemetery and the townsites of Woodhaven and Banff have been completed but considerable work still remains to be done in connection with Fitzhugh and the villa lot section of Banff.

For some time this staff has been labouring under the handicap of insufficient accommodation, it being necessary to have some of the members working in the rooms belonging to other sections. This, however, has been remedied. During the year the staff of Section IV removed to the Imperial Building and the room formerly used by them is now occupied by part of this staff.

The strength of the staff is 24 and in addition there is at present one temporary employee. This is four short of the required number and as a result a good deal of the less urgent work has had to be laid aside for the present.

## SECOND SECTION—EXAMINATION OF RETURNS OF SURVEY.

*(T. S. Nash, Chief of Section.)*

In this section examination is made of the returns of survey of all Dominion Lands other than those in the railway belt in British Columbia and the necessary plans thereof are prepared.

As soon as a surveyor completes the survey of a township, or a portion thereof, he forwards a sketch showing the progress of his work. These sketches are examined to see that correct methods are being employed and that satisfactory results are being



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obtained. 375 progress sketches from contractors, 532 from men employed by the day, and 195 from inspectors of contract surveys were examined making a total of 1,102 sketches.

A radical change was made in the method of dealing with water areas in the prairie provinces. Experience has shown that many of the bodies of water commonly called lakes are not permanent bodies of water since they vary largely in area according to the amount of annual precipitation. Surveyors define the position of the banks of these bodies of water to the best of their ability at the time of survey and in the preparation of the township plans areas have heretofore been calculated to the bank. This variable bank has not proved a satisfactory boundary and it has now been decided to use the information supplied by the surveyor to make a selection of certain aliquot parts of the quarter sections adjoining such bodies of water and to show the areas of these parts upon the plans for purposes of disposal. This change in method necessitated the changing of about two hundred plans that had been completed in the former way. It was also decided to omit the areas of patented lands from plans that are being amended. This involves considerable clerical work in obtaining the information to the date of confirmation of the plan. These changes have made it advisable to resume the practice of re-compiling plans that are out of print. 602 township plans were compiled, 290 of which were first edition plans.

Examination was made of 206 subdivision surveys, 142 miscellaneous and 274 township outlines. Compiled plans of 63 miscellaneous surveys, 4 settlements and 16 timber berths were made. Four hundred and thirteen memoranda on examination of survey returns were sent to surveyors and 446 replies were received and the necessary corrections made. The number of draft letters prepared was 1,520. Thirty-nine contract accounts were prepared and closed as the work was shown by the inspectors' report to be satisfactorily performed.

Considerable progress was made with the maps of the Yukón Territory mentioned in last year's report. Eight sheets in the vicinity of Dawson are now completed, three at Tantalus and a chain of five sheets between Whitehorse and the British Columbia boundary. Six group lot surveys and the survey of base lines on several tributaries of Stewart river were examined.

Requests for information from other Branches of the Department involved the writing of 288 memoranda, the preparation of 137 sketches, and the calculation of 940 areas. The field notes were examined and plans prepared for 16 timber berths comprising 27 blocks whose boundaries totalled 255 miles of survey and whose area is approximately 98 square miles. The returns of nine other timber berths were examined also.

The plans of road diversions submitted by the Provincial Governments have been examined to the number of 341. Of railways 155 plans of right-of-way were examined, the mileage of which is 2,891. As many of these plans were in duplicate, or triplicate, the gross mileage of plans examined was 4,418.

A great deal of time has been spent upon the preparation of a topographical map of the valley of Fiddle creek in Jasper Park, and on the preparation of a new plan of the town of Banff.

Five men resigned from the staff during the year and two were appointed, the staff now consisting of 23 permanent clerks and two temporary employees.

#### THIRD SECTION—DRAWING FOR REPRODUCTION.

*(C. Engler, Chief of Section.)*

The work of this section consists in drawing plans for reproduction by photography and lithography, and of any work of like nature arising in the other sections of this Branch of the Department. Wherever possible, letters and figures are made by means of type, a small press or small tripods being used for printing.



## SESSIONAL PAPER No. 25b

The output of plans of townships, the main work of the section, has been somewhat smaller than usual owing to changes made in the method of representing lake shores and areas bordering on lakes. Before a satisfactory way of showing these was arrived at several of the first methods had to be abandoned after considerable work had been done on plans in each case. Generally speaking, plans of resurveys and corrected editions of plans are more complicated than first editions and require more time and special attention to exceptional details, not going so regularly through the ordinary routine.

Below is a statement of work done.

Plans of townships prepared for printing. . . . .	538
Plans of settlements, subdivisions, group lots, townsites, villa lots, &c. . . . .	69
Plans to accompany Orders in Council. . . . .	13
Miscellaneous plans, such as timber berths, sketch maps, profiles, drawing of apparatus, &c. . . . .	117
Surveying instruments and steel tapes engraved with numbers or monograms. . . . .	117
Certificates and Commissions engrossed for Board of Examiners for Dominion Land surveyors. . . . .	56
Colored designs for pamphlet covers, sketches for half tones for pamphlets, &c. . . . .	20
Total. . . . .	930

No changes in the regular staff have occurred during the year, but five additional temporary clerks have been employed since January 1, 1913.

## FOURTH SECTION—SURVEYS IN THE RAILWAY BELT—BRITISH COLUMBIA.

(*E.L. Rowan-Legg, Chief of Section.*)

The work of this section has been the preparing of preliminary plans from sketches sent in by surveyors, showing the progress of their work in the field, the examination of surveyors' field notes and plots, the compiling of township and other plans, the comparing of fair copies of township and other plans and replying to requests for various information.

The work done has been as follows:—

Preliminary plans compiled 52, and copies made 260; surveyors' field books of subdivision surveys examined 27, and plots 29; of mineral claims 3; of miscellaneous surveys 13; township plans compiled 98; townsite plans compiled 2; miscellaneous plans compiled 2; fair copies of compiled plans compared 131; various plots and sketches made 142; odd jobs and requests for various information dealt with 312; draft letters and memoranda written, 341.

A schedule of Indian reserves was prepared to accompany a report of the Minister of the Interior recommending that the lands included in these reserves be withdrawn from the operations of the regulations for the administration and disposal of lands within the railway belt. This recommendation was approved by Order in Council of January 25, 1913.

The staff of this section consisted of seven men, but this number was reduced by the removal of one to another section of the Branch, the absence of two for a considerable length of time on sick leave, and by the illness and death of Mr. Henry Lawe, D.L.S., who was a faithful and most industrious member of this staff for nine years. The staff, therefore, is reduced to five men.



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As it was found that the building on Metcalfe street was too crowded, it was considered advisable that this staff should be moved to other quarters; it now occupies a room in the Imperial Building on Queen street.

## FIFTH SECTION—MAPPING.

*(J. Smith, Chief of Section.)*

The work of the fifth section is principally on the sectional maps, compiling new ones as required and revising old ones, keeping them up to date as to new surveys, railways, post offices, &c., and also making other maps that require the work of expert draughtsmen.

Apart from the sectional maps, work, equivalent to the work of one man for 245 days, was done by this section on miscellaneous drawings to accompany reports of surveyors, and 28 days were spent in revising the map of the Peace River district.

On January 1, 1913, the staff of this section was increased by the transfer from the Sixth Section of four men whose principal work is the compiling of pamphlets descriptive of the newly surveyed districts of the western provinces. The pamphlets contain not only all the reports received from surveyors between July, 1911, and July, 1912, but also all the available information respecting the natural features and resources of the district.

All available information was collected and edited for the St. Ann, Saddle Lake, Shell River, Brule and Duck Mountain pamphlets which contain descriptions of one hundred and twenty-three townships each.

The staff of this section now numbers seventeen.

Illness and accidents caused loss of work during the year equivalent to the work of one man for 345 days, which is about 8½ per cent of the aggregate time of the staff.

## SIXTH SECTION—SCIENTIFIC AND TOPOGRAPHICAL WORK.

*(G. Blanchard Dodge, Chief of Section.)*

The work performed in general in this section consists of issuing instructions for and plotting returns of levels on meridians and base lines, checking and reducing magnetic observations, calculating astronomical field tables, testing and adjusting survey instruments, and preparing and issuing the pamphlets containing surveyors' township reports, &c. The level work was in large part transferred in the early part of the year to the Calgary office of the Branch. The preparation of the pamphlets containing the surveyors' township reports was on December 31, 1912, transferred to the Fifth Section.

The number of magnetic declination returns received for the year ended March 31, 1913, is 1,278, making a total to date since 1908 of 4,114. Dip and total force observations for the year number 30, with a total of dip observations since 1908, of 144, and of total force observations 120. A statement of the observations for the past year is published with this report.

In Appendix No. 50 of the Annual Report of the Branch for 1911, on the determination of the magnetic declination, dip and total force in Western Canada, in Table No. 3, the logarithms of the total intensity are given instead of the natural values. The Table has been reprinted and accompanies the statement of the declination observations in the present report.

The computations of the triangulation in the railway belt of British Columbia are in hand. It is expected that full information for that portion extending from the Salmon Arm base to the Kootenay base will be available during the coming winter.

All the returns of azimuth observations for the year 1911 received during 1912 have been examined and checked and also the latitude observations of Mr. J. A.



SESSIONAL PAPER No. 25b

Fletcher, D.L.S., taken during 1912. The astronomical field tables for the year have been computed.

The following reports of townships have been compiled from the surveyors' reports and sent to press from April 1, 1912, to December 31, 1912.

1. Reports on townships east and west of the Principal Meridian and west of the Second Meridian.

2. Reports on townships west of the Third Meridian.

3. Reports on townships west of the Fourth Meridian.

4. Reports on townships west of the Fifth and Sixth Meridians.

5. Reports on townships in the railway belt, B.C.

The work done at the Surveys Laboratory for the past year, includes the testing and adjusting of 10 block survey transits, 72 subdivision transits, 60 sidereal watches, and 62 subsidiary standards of length.

The number of letters received during the year was 450 while the number of letters sent was 1,203, besides 380 memoranda. Sixty letters of instructions to surveyors were prepared.

The staff at the close of the fiscal year consisted of seventeen permanent and three temporary clerks.

#### PHOTOGRAPHIC OFFICE.

*(J. Woodruff, Chief Photographer.)*

The work of the Chief Photographer shows a slight decrease in the total number of jobs for the year. This, however, is more than compensated for by the fact that there has been a very large increase in the number of Vandyke and blue prints made, and these are of much larger size than those of previous years.

A new Enlarging Camera is under construction capable of taking negatives up to 20 inches instead of 14 inches as in the present camera. This will facilitate bromide enlarging, and permit of much quicker and better work being done.

#### PHOTOGRAPHIC OFFICE.

*(H. K. Carruthers, Process Photographer.)*

While the negatives and photo-liths appear to be smaller in number this year than last, the fact must not be overlooked that we are now handling much larger plates. An original which previously took four (4) 15 x 18 inch negatives is now made on a 24 x 32 inch plate, and the same procedure is followed in printing on zinc plates.

A new board of unique type has been placed on the copying camera. On the back is a frame made of steel angle iron with cross bars. By the adjusting of some twenty fine threaded screws, the whole surface of the board can be made perfectly flat.

Millimeter scales of brass have been added to the scaling rod making our reductions and enlargements more accurate.

A plate glass fifty inches square in a sliding frame hung from the steel rails above, keeps the copies in close contact with the board and is automatically held there, or released, by catches at the back.

#### BOARD OF EXAMINERS FOR DOMINION LAND SURVEYORS.

*(F. D. Henderson, Secretary.)*

The Board of Examiners held two meetings during the year. The first was a special meeting lasting from April 27 to June 1 (inclusive), 1912, during which examinations were held at Ottawa, Toronto, Calgary and Edmonton. The second was



the regular annual meeting which began February 10 ('the second Monday in the month of February' as provided in the D.L.S. Act, section 9) and lasted until March 27, 1913. Examinations were held at Ottawa, Kingston, Toronto, Winnipeg, Calgary and Edmonton. Two hundred and seventy-one candidates were examined.

Following are the names of the successful candidates:

#### PRELIMINARY EXAMINATION (56).

Albrecht, Eric W., Ottawa, Ont.	Lumb, William Ewart, Fort Stewart, Ont.
Alport, Frederic, Orillia, Ont.	Macdonald, Leslie Stuart, Prince Edward Island.
Badgley, Leonard Amey, Canfield, Ont.	Macdonald, Charles Alexander, Toronto, Ont.
Ball, Alfred Nepean, Grenfell, Sask.	Masson, Duncan Morrison, Toronto, Ont.
Batters, G. W. Stanley, Edmonton, Alta.	Matheson, Alexander, Armow, Ont.
Beatty, Frank Weldon, Pembroke, Ont.	Melrose, Thomas Montague, Coaticook, P.Q.
Beatty, William Benjamin, Sarnia, Ont.	Mitchell, John Clarence, London, Ont.
Bedard, Henry J., Courtright, Ont.	Morse, Graham Parsons, Prince Albert, Sask.
Bick, Arthur Hardie, Ottawa, Ont.	McAndrew, Joseph Benedict, St. Catharines, Ont.
Bromley, Robert Cecil, Winnipeg, Man.	McNally, Henry Augustine, Westport, Ont.
Brown, Ernest Frank, Ottawa, Ont.	Ney, Cecil Herman, Aurora, Ont.
Brownlee, William Fisher, Macdonald's Corners, Ont.	O'Sullivan, J. F. Blake, Quebec, P.Q.
Bruynseraede, René Paul P. A., Edmonton, Alta.	Petrie, Edward, Ottawa, Ont.
Calvin, Collamer Chipman, Kingston, Ont.	Raley, William Emsley, Lethbridge, Alta.
Carson, John Alton, Vancouver, B.C.	Rance, Charles Clarence, Toronto, Ont.
Child, Cyril George, Calgary, Alta.	Robinson, William Earl, Beatbton, Ont.
Clendinning, James, Lurgan, Ireland.	Robinson, Edward Keith, Kingston, Ont.
Cuthbertson, William, Perth, Ont.	Ross, William Wrighton Eustache, Pembroke, Ont.
Daly, William Patrick, Ottawa, Ont.	Seibert, Percy T., Southampton, Ont.
Dawson, Wilfrid Laurier, Ottawa, Ont.	Scott, Buckton Arthur, Edmonton, Alta.
Douglas, Frederick William, Toronto, Ont.	Teare, Frank, Toronto, Ont.
Falls, Orville M., Toronto, Ont.	Thomas, Llewellyn Olding, Westmount, Que
French, Merritt Henry, Calgary, Alta.	Venny, Leonard Thomas, Brockville, Ont
Gray, Blair, Komoka, Ont.	Van Patter, Hugh Stanley, Aylmer, Ont.
Hughes, Charles, Calgary, Alta.	Watson, Frederick Errol, Toronto, Ont.
Hunt, Septimus, Calgary, Alta.	Wilkinson, Robert Greenless, Regina, Sask.
Humphreys, Wilfrid, Winnipeg, Man.	Wilson, James Clarence, Wingham, Ont.
Hyatt, Albert Edward, Revelstoke, B.C.	
Knight, Sydney, Edmonton, Alta.	

#### FINAL EXAMINATION (44).

Baird, Wilmot Johnston, Scarboro, Ont.	Malcolm, William Lindsay, Guelph, Ont.
Beresford, Henry Edward, Portage la Prairie, Man.	Milliken, John Bolton, Ottawa, Ont.
Buchanan, John Alexander, Edmonton, Alta.	McArthur, Alexander Stanley, Toronto, Ont.
Calder, John Alexander, Ashcroft, B.C.	McDonald, Harold French, Winnipeg, Man.
Cameron, Charles Scott, Regina, Sask.	McElhanney, Thomas Andrew, Vancouver, B.C.
Cameron, Maxwell George, Peterborough, Ont.	McKay, Robert B., Vancouver, B.C.
Cannell, Herbert William, Ottawa, Ont.	McLellan, Roy Alexander, Harriston, Ont.
Carsecallen, Hobart Rodney, Calgary, Alta.	Nesham, Edward Williams, Ottawa, Ont.
Carthew, John Trewalla, Edmonton, Alta.	Parry, Harry, Ottawa, Ont.
Coltham, George William, Aurora, Ont.	Pearson, Hugh Edward, Edmonton, Alta.
Cordukes, John Philip, Ottawa, Ont.	Pinder, George Zouch, Edmonton, Alta.
Coumans, Oliver Frank, Chepstow, Ont.	Pounder, John Allan, Ottawa, Ont.
Donnelly, Cecil, Winnipeg, Man.	Ratz, John Earl, Ottawa, Ont.
Elliott, George Reginald, Goderich, Ont.	Reid, John, Winnipeg, Man.
Ellis, Douglas Stewart, Kingston, Ont.	Robertson, Edgar Doctor, Edmonton, Alta.
Fletcher, William Arthur, Calgary, Alta.	Segre, Beresford Henry, Toronto, Ont.
Johnson, Hubert Colpoys, Ottawa, Ont.	Seigner, William Adam, Toronto, Ont.
Johnston, Charles Ernest, Toronto, Ont.	Vickers, Thomas Newell, Renwick, Ont.
Johnston, James Homer, Cottam, Ont.	von Edeskuty, Joseph Otto, Vancouver, B.C.
Lamb, Frederick Carlyle, Saskatoon, Sask.	Wadlin, Lorenzo Norette, Ottawa, Ont.
Macdonald, George Alexander, Muirkirk, Ont.	Warrington, George Albert, Winnipeg, Man.
	Waugh, Bruce Wallace, Berlin, Ont.
	Weld, William Elfred, Ottawa, Ont.

The answer-papers of all candidates were sent to Ottawa as usual and the reading and valuation of these formed a large part of the work of the Board. At each meeting also a complete set of question papers was prepared to be held in readiness for the next examination.



## SESSIONAL PAPER No. 25b

Provincial surveyors writing under section 21 of the Act, are required to produce their provincial certificates, and other final candidates are required to produce affidavits of service under articles. All such evidence was examined and passed upon by the Board. Two minors who had presented themselves for final examination were admitted on the understanding that in case they were successful their commissions would not issue until they became of age and furnished affidavits in the regular form.

Several applications were received from college graduates asking to be admitted to the privileges of the shorter term of service under articles as provided for by section 22 of the Act. Favourable decisions were given in the following cases:—

(a) Graduates of the School of Mining, Kingston, in the Power Development Course.

(b) Graduates of the University of Alberta, who have taken certain courses in the Department of Applied Science.

(c) Graduates in Civil Engineering of Dalhousie University, Nova Scotia.

A form of Instructions to Presiding Examiners was drawn up and adopted. It is hoped by this means to secure uniformity in the method of dealing with candidates and in the manner of sending in the returns, and thus to facilitate the work of the Board.

Short forms for articles of apprenticeship and for transfer of articles were drawn up. These were afterwards passed by Order in Council and are now in use. They replace forms B and E in the Appendix to the Act.

Thirty-four commissions as Dominion Land surveyors were issued to those who had passed the final examination, and had furnished oaths of office and allegiance and bonds for the sum of one thousand dollars as required by section 25 of the Dominion Lands Surveys Act.

Every Dominion Land surveyor is required to be in possession of a subsidiary standard of length (D.L.S. Act, Section 35). The issue of the style of standard which has been in use for some years was discontinued in May, and a new model was adopted which, however, was not ready for distribution until October. It is a steel tape one-quarter of an inch wide and a little over 0.012 of an inch thick. It shows links on one side and feet on the other. The new standard weighs nearly one pound less than the old; it is also more accurate and more convenient for use. Forty-seven standards were issued during the year after having been carefully tested in the Surveys Laboratory. Forty-five of these went to Dominion Land surveyors and two to provincial surveyors. A list of Dominion Land surveyors who are in possession of standard measures, will be found in Appendix No. 10.

In February the office of the Secretary of the Board was removed from the Topographical Surveys Branch, Metcalfe street, to the Imperial Building, Queen street. A more commodious room was secured which will also serve for a Board Room. A type-writer clerk has also been appointed to assist with the work.

The correspondence of the Board was as follows:—

Letters received. . . . .	1,656
Letters sent. . . . .	781
Circular letters, pamphlets, notices, &c., sent. . . . .	1,783

The following table shows the number who have tried the various examinations each year since 1900, and the number and percentage of successful candidates:—



FISCAL YEAR.	PRELIMINARY.			FINAL.			D. T. S.			TOTAL.		
	Tried.	Pas'd.	Per cent Pas'd.	Tried.	Pas'd.	Per cent Pas'd.	Tried.	Pas'd.	Per cent Pas'd.	Tried.	Pas'd.	Per cent Pas'd.
1899-00...	7	6	86	5	4	80	0	.....	.....	12	10	83
1900-01...	5	5	100	5	5	100	0	.....	.....	10	10	100
1901-02...	30	26	87	10	9	90	0	.....	.....	40	35	88
1902-03...	31	22	71	8	8	100	0	.....	.....	39	30	77
1903-04...	43	37	86	18	13	72	0	.....	.....	61	50	82
1904-05...	57	42	74	23	20	87	1	0	.....	81	62	77
1905-06...	36	25	70	27	19	70	4	.....	.....	67	44	66
1906-07...	20	15	75	20	15	75	1	0	.....	41	30	73
1907-08...	132	67	51	23	21	75	1	0	.....	161	88	55
1908-09...	224	88	39	52	27	52	3	1	33	279	116	42
1909-10...	289	97	34	72	37	51	1	0	.....	362	134	37
1910-11...	186	64	34	69	33	55	2	1	50	257	103	40
1911-12...	195	57	29	71	48	68	2	0	.....	268	105	39
1912-13...	187	56	30	83	44	53	1	0	.....	271	100	37

## APPENDICES.

The following schedules and statements are appended:—

No. 1. Schedule of surveyors employed and work executed by them from April 1, 1912, to March 31, 1913.

No. 2. Schedule showing for each surveyor employed from April 1, 1912, to March 31, 1913, the number of miles surveyed of township section lines, township outlines, traverses of lakes and rivers and resurvey; also the cost of the same.

No. 3. List of lots in the Yukon Territory, surveys of which have been received from April 1, 1912, to March 31, 1913.

No. 4. List of miscellaneous surveys in the Yukon Territory, returns of which have been received from April 1, 1912, to March 31, 1913.

No. 5. Statement of work executed in the office of the chief draughtsman.

No. 6. List of new editions of sectional maps issued from April 1, 1912, to March 31, 1913.

No. 7. Statement of work executed in the photographic office from April 1, 1912, to March 31, 1913.

No. 8. Statement of work executed in the lithographic office from April 1, 1912, to March 31, 1913.

No. 9. List of Employees of the Topographical Surveys Branch at Ottawa, giving the name, classification, duties of office and salary of each.

No. 10. List of Dominion Land Surveyors who are in possession of standard measures.

Nos. 11 to 51. Reports of surveyors employed.

No. 52. Results of observations for magnetic declination.



SESSIONAL PAPER No. 25b

MAPS AND PROFILES.

The following maps and profiles accompany this report:—

Map showing surveys to March 31, 1913.

Maps to accompany reports of surveyors.

Profiles of meridians and base lines.

I have the honour to be, Sir,

Your obedient servant,

E. DEVILLE,

*Surveyor General.*







# TOPOGRAPHICAL SURVEYS BRANCH

## SCHEDULES AND STATEMENTS.

### APPENDIX No. 1.

SCHEDULE of Surveyors employed and work executed by them from April 1, 1912, to March 31, 1913.

Surveyor.	Address.	Description of Work.
Akins, J. R..	Ottawa, Ont..	Survey of the twentieth base line across ranges 18 to 26, the twenty-third base line across ranges 1 to 8 and part of range 9, the twenty-second base line across ranges 5, 6 and part of 7 and the east outlines of townships 85 and 86, range 5, and part of township 85, range 6, west of the sixth meridian. Correction survey of the sixth meridian from the twenty-second to the twenty-third base line. Resurvey in townships 75, ranges 14 and 15, west of the fifth meridian, and of the north boundary of township 84, range 4, west of the sixth meridian.
Allison, C. B..	South Woodslee, Ont..	Contract No. 13 of 1912. Subdivision of townships 34, 35 and 36, ranges 16 and 17, west of the principal meridian.
Aylsworth, C. F..	Madoc, Ont..	Resurvey in township 18, range 1, east of the principal meridian, and in townships 22 and 23, range 5, west of the principal meridian. Retracement in townships 15, 16 and 25, range 6, and township 25, range 7, east of the principal meridian.
Belanger, P. R. A..	Ottawa, Ont..	Inspection of contracts Nos. 2, 4, 5 and 6 of 1911, and Nos. 16, 17, 18 and 20 of 1912. Resurvey in township 8, range 12, west of the principal meridian. Traverse of Assiniboine river in townships 8, ranges 12 and 13, west of the principal meridian. Survey of timber berth No. 1920 in township 44, range 4, west of the second meridian. Retracement survey in townships 14, ranges 5 and 6, west of the principal meridian.
Bennett, G. A..	Calgary, Alta..	Subdivision in townships 45, ranges 10 and 11, west of the second meridian. Retracement survey in township 18, range 2, townships 21, ranges 4 and 7, township 22, range 8, township 6, range 9, township 18, range 10, township 21, range 14, township 30, range 15, township 20, range 20, township 28, range 30, townships 18 and 19, range 31, townships 18, 19 and 31, range 32, and townships 18 and 19, range 33, west of the principal meridian; township 34, range 1, townships 14, ranges 4 and 5, township 26, range 6, and townships 15, ranges 25 and 26, west of the second meridian. Correction survey



APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1912, to March 31, 1913—*Continued.*

Surveyor.	Address.	Description of Work.
		in townships 9 and 10, range 17, east of the principal meridian; township 21, range 2, township 33, range 19 and township 18, range 20, west of the principal meridian; township 6, range 14, west of the second meridian. Resurvey in township 1, range 14, east of the principal meridian. Traverse in townships 21, ranges 4 and 7, and township 30, range 15, west of the principal meridian; township 34, range 1, west of the second meridian. Investigation survey in townships 15 and 16, range 4, west of the principal meridian; townships 5, ranges 15 and 16, and townships 15, ranges 25 and 26, west of the second meridian.
Berry, E. W. . . . .	Seaforth, Ont. . . . .	Subdivision surveys along the Canadian Northern railway in townships 57 and 58, range 25, townships 55, 56, 57 and 58, range 26, townships 52 and 53, range 28, townships 51 and 52, range 29, and township 52, range 30, west of the principal meridian.
Blanchet, G. H. . . . .	Ottawa, Ont. . . . .	Survey of the nineteenth base line across ranges 6 to 26, west of the fourth meridian.
Bowman, E. P. . . . .	West Montrose, Ont. . . . .	Contract No. 7 of 1912. Subdivision of township 23, range 3, townships 28 and 29, range 4, and township 28, range 5, west of the principal meridian.
Brenot, L. . . . .	Ottawa, Ont. . . . .	Subdivision surveys in township 84, range 17, townships 83 and 84, ranges 18 and 19, and townships 81, ranges 25 and 26, west of the sixth meridian. Survey of the north outline of township 83, range 22, west of the sixth meridian, and the east outlines of townships 84, ranges 20, 22 and 23, west of the sixth meridian.
Bridgland, M. P. . . . .	Calgary, Alta. . . . .	Survey of villa lots at Banff. Triangulation survey in the railway belt of British Columbia in the vicinity of Salmon Arm and Revelstoke.
Calder, J. A. . . . .	Lytton, B.C. . . . .	Subdivision in township 20, range 21, townships 20 and 21, range 22, townships 13, 14, 20 and 21, range 23, townships 16 and 17, ranges 24 and 25, townships 15, ranges 26, 27 and 28, and townships 15 and 16, range 29, west of the sixth meridian. Resurvey in township 21, range 22, townships 14 and 21, range 23, townships 16 and 17, range 25, and townships 15, ranges 26 and 27, west of the sixth meridian. Traverse in township 21, range 22, townships 13, 14 and 21, range 23, townships 16 and 17, range 24, townships 16, 17 and 19, range 25, townships 15, ranges 26, 27 and 28, and townships 15 and 16, range 29, west of the sixth meridian.
Campbell, A. S. . . . .	Kingston, Ont. . . . .	Resurvey of township 53, range 19, and township 49, range 20, west of the fourth meridian. Retracement survey in township 53, range 21, west of the fourth meridian. Resurvey in Lake St. Ann settlement in townships 54, ranges 3 and 4, west of the fifth meridian.



## SESSIONAL PAPER No. 25b

APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1912, to March 31, 1913—*Continued.*

Surveyor.	Address.	Description of Work.
Chase, A. V.. . . .	Orillia, Ont.. . . .	Examination of lands in the Kamloops district of the railway belt, British Columbia, for the purpose of classification into fruit land, farming land, grazing land, timber land and worthless land.
Christie, W.. . . .	Prince Albert, Sask....	Contract No. 20 of 1912. Subdivision of townships 56 and 57, range 6, township 57, range 7, and parts of township 58, range 6, and township 56, range 7, west of the third meridian.
Cowper, G. C.. . . .	Welland, Ont.. . . .	Subdivision survey in townships 17 and 18, range 3, township 17, range 4, and townships 21 and 22, range 10, west of the fourth meridian. Retracement survey in townships 17, 18 and 19, range 3, township 19, range 4, and township 53, range 27, west of the fourth meridian. Resurvey in township 17, range 4, townships 21 and 22, range 10, and township 10, range 12, west of the fourth meridian. Traverse in township 60, range 1, and townships 61, ranges 4, 10 and 12, west of the fourth meridian. Investigation in townships 40 and 44, range 5, township 35, range 14, and townships 51, ranges 17 and 26, west of the fourth meridian.
Cumming, A. L.. . . .	Edmonton, Alta.. . . .	Contract No. 31 of 1912. Subdivision of townships 62 and 63, range 21, and townships 61, 62 and 63, range 22, west of the third meridian.
Davies, T. A.. . . .	Edmonton, Alta.. . . .	Contract No. 34 of 1912. Subdivision of townships 69 and the south two-thirds of townships 70, ranges 10, 11 and 12, and the south two-thirds of township 70, range 13, west of the fourth meridian.
Day, H. S.. . . . .	Edmonton, Alta.. . . .	Contract No. 16 of 1912. Subdivision of townships 52, ranges 16 and 17, and townships 52 and 53, range 18, west of the second meridian.
Deans, W. J.. . . .	Brandon, Man.. . . .	Inspection of contracts No. 24 of 1908, No. 19 of 1909, Nos. 1, 7 and 11 of 1911, and Nos. 5, 6, 7, 8, 9, 10, 11 and 12 of 1912. Retracement survey in township 49, range 9, townships 50 and 51, range 12, and township 51, range 13, west of the third meridian. Traverse of Brereton lake in townships 10 and 11, ranges 14 and 15, east of the principal meridian. Survey of timber berth No. 1903 in townships 7 and 8, range 16, and township 8, range 17, east of the principal meridian.
Evans, S. L.. . . .	Corinth, Ont.. . . .	Subdivision in township 19, range 4, west of the fifth meridian. Survey of part of the east outline of township 20, range 6, west of the fifth meridian. Resurvey in township 13, range 14, west of the third meridian. Retracement survey in townships 6, ranges 24, 25, 26 and 27, township 7, range 28, and township 8, range 22, west of the third meridian. Traverse of Oldman river in townships 9, ranges 25 and 26, west of the fourth meridian.



APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1912, to March 31, 1913—*Continued.*

Surveyor.	Address.	Description of Work.
Fairechild, C. C. . . . .	Edmonton, Alta. . . . .	Contract No. 36 of 1912. Subdivision of townships 63 and 64, ranges 5 and 6, west of the fifth meridian.
Fawcett, A. . . . .	Gravenhurst, Ont. . . . .	Contract No. 11 of 1912. Subdivision of township 23, range 12, townships 23, 30, 31, 32 and 33, range 13, and the portions of townships 30 and 31, range 12, west of lake Manitoba, west of the principal meridian.
Fletcher, J. A. . . . .	Ottawa, Ont. . . . .	Latitude observations on the second meridian in township 61, on the third meridian in township 57, on the fifth meridian at triangulation station I near Calgary, on the sixth meridian in township 48, at the north end of the base line on Salmon Arm, and on Sugarloaf mountain.
Fontaine, L. E. . . . .	Lévis, Que. . . . .	Inspection of contracts Nos. 25, 26 and 28 of 1911, and Nos. 1, 2, 3 and 4 of 1912.
Francis, J. . . . .	Portage la Prairie, Man. . . . .	Contract No. 5 of 1912. Subdivision of township 21, range 11, townships 21 and 22, ranges 12 and 13, west of the principal meridian. Resurvey in township 14, range 7, west of the principal meridian.
Galletly, J. S. . . . .	Brooklin, Ont. . . . .	Subdivision in township 73, range 6, townships 108 and 109, ranges 12, 13 and 14, townships 107 and 109, range 15, township 109, range 16, townships 83 and 84, range 21, west of the fifth meridian. Survey of the east outlines of townships 108, ranges 15 and 16, west of the fifth meridian. Miscellaneous lot surveys at Peace River Crossing.
Gibbon, J. . . . .	Vancouver, B.C. . . . .	Contract No. 8 of 1912. Subdivision of township 29 and part of township 30, range 5, and townships 28 and 29, range 6, west of the principal meridian.
Grassie, C. A. . . . .	Medicine Hat, Alta. . . . .	Subdivision in townships 49 and 50, range 27, and townships 48 and 49, range 28, west of the fifth meridian; townships 45, 47, 48 and 49, range 1, and townships 45, ranges 2, 3 and 4, west of the sixth meridian. Traverse on Snaring and Athabaska rivers in township 46, range 1, west of the sixth meridian.
Hawkins, A. H. . . . .	Listowel, Ont. . . . .	Survey of the twenty-third base line from the fifth to the sixth meridian, and of the sixth meridian through townships 89 and 90.
Herriot, G. H. . . . .	Ottawa, Ont. . . . .	Survey of the principal meridian from the sixteenth base line to the northeast corner of section 24, township 72.
Heuperman, L. F. . . . .	Calgary, Alta. . . . .	Subdivision in township 11, range 30, west of the fourth meridian.
Jackson, J. E. . . . .	Hamilton, Ont. . . . .	Contract No. 9 of 1912. Subdivision of townships 30, 31 and 32, range 6, townships 30 and 31, range 7, and part of township 30, range 8, west of the principal meridian.



## SESSIONAL PAPER No. 25b

APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1912, to March 31, 1913—*Continued.*

Surveyor.	Address.	Description of Work.
Lighthall, A. . . . .	Vancouver, B.C. . . . .	Subdivision in townships 4 and 5, range 27, and township 4, range 28, west of the sixth meridian, townships 6, ranges 5, 6 and 7, west of the seventh meridian. Resurvey in township 5, range 26, west of the sixth meridian; townships 19 and 41, east of the coast meridian. Traverse in townships 4 and 5, range 26, and townships 4, ranges 27 and 28, west of the sixth meridian; townships 6, ranges 5 and 7, west of the seventh meridian; townships 11, 12 and 19, east of the coast meridian. Survey of timber berth No. 554 in township 3, range 25, and townships 3, 4 and 5, range 26, west of the sixth meridian; timber berth No. 555 in township 6, range 7, west of the seventh meridian; timber berth No. 557 in township 6, range 5, west of the seventh meridian.
Lonergan, G. J. . . . .	Buckingham, Que. . . . .	Inspection of contracts Nos. 22, 25 and 26 of 1910, Nos. 20 and 28 of 1911, and Nos. 34, 35 and 36 of 1912. Resurvey in township 53, range 25, west of the third meridian; townships 63 and 64, ranges 3, 4, 5, 6, 7, 8, 9 and 10, west of the fourth meridian. Traverse in township 63, range 18, west of the fourth meridian. Survey of timber berth No. 1914 in township 42, range 6, west of the fifth meridian.
Loucks, R. W. E. . . . .	Saskatoon, Sask. . . . .	Contract No. 21 of 1912. Subdivision of township 54, range 9, and townships 53 and 54, ranges 10 and 11, west of the third meridian. Survey of the east outlines of townships 55 and 56, range 10, and township 55, range 11, west of the third meridian.
MacLennan, A. L. . . . .	Toronto, Ont. . . . .	Contract No. 15 of 1912. Subdivision of township 49 and the south two-thirds of township 50, range 9, townships 49 and 50, range 10, west of the second meridian. Survey of the east outlines of townships 51 and 52, range 10, west of the second meridian.
Martindale, E. S. . . . .	Kingsmill, Ont. . . . .	Subdivision in townships 16 and 17, range 5, townships 17 and 18, range 6, township 18, range 7, township 19, range 8, and township 20, range 9, west of the fifth meridian. Retracement survey in townships 6, ranges 1 and 2, west of the fourth meridian. Subdivision of villa lots at Elkwater lake in township 8, range 3, west of the fourth meridian.
Martyn, O. W. . . . .	Regina, Sask. . . . .	Contract No. 17 of 1912. Subdivision of townships 52 and 53, ranges 19 and 20, west of the second meridian.
Matheson, H. . . . .	Ottawa, Ont. . . . .	Topographical surveys on the east slope of the valley of Fiddle creek in the Jasper Forest Park reserve in western Alberta. Subdivision in townships 48, 49 and 50, range 16, and township 48, range 17, west of the fifth meridian.



APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1912, to March 31, 1913—*Continued.*

Surveyor.	Address.	Description of Work.
Melhuish, P...	Vancouver, B.C.	Subdivision in township 8, range 25, townships 7, 8, 10 and 11, range 26, and township 12, range 27, west of the sixth meridian. Resurvey in townships 8, 10, 11 and 12, range 26, west of the sixth meridian. Traverse in township 8, range 25, townships 7, 8, 9, 10, 11 and 12, range 26, and townships 8 and 9, range 27, west of the sixth meridian. Survey of timber berth No. 552 in township 8, range 26, and townships 8 and 9, range 27, west of the sixth meridian.
Miles, C. F.	Toronto, Ont.	Inspection of contracts No. 14 of 1910, Nos. 14 and 33 of 1911, Nos. 21, 22, 24, 25, 29 and 30 of 1912. Retracement survey in township 63, range 1, west of the fourth meridian. Traverse in township 58, range 21, west of the third meridian. Survey of Green Lake settlement in townships 61, ranges 12 and 13, west of the third meridian.
Molloy, J.	Winnipeg, Man.	Contract No. 1 of 1911. Subdivision of townships 12, ranges 13, 14, 15 and 16, and townships 11, ranges 15 and 16, east of the principal meridian.
Montgomery, R. H.	Prince Albert, Sask.	Contract No. 19 of 1912. Subdivision of townships 55 and 56, range 4, and townships 54, 55 and 56, range 5, west of the third meridian.
Morrier, J. E.	Prince Albert, Sask.	Contract No. 18 of 1912. Subdivision of townships 56, ranges 1, 2 and 3, the east halves of townships 54 and 55, range 1, and the north two-thirds of township 55, range 3, west of the third meridian.
McEwen, D. F.	Edmonton, Alta.	Contract No. 30 of 1912. Subdivision of township 63, range 19, townships 61, 62 and 63, range 20, township 61, range 21, west of the third meridian. Survey of the east outlines of townships 61, ranges 20 and 21, west of the third meridian.
McFarlane, J. B.	Toronto, Ont.	Production of the fourth meridian from the northeast corner of township 105 to the quarter section post on the east boundary of section 12, township 115, and the twenty-fourth base line across range 5 and part of range 6, west of the fourth meridian.
McFarlane, W. G.	Peace River Crossing, Alta.	Contract No. 1 of 1912. Subdivision of township 75 and the north two-thirds of townships 74, ranges 6, 7, 8 and 9, the south two-thirds of township 70, range 11, township 73 and the south two-thirds of township 74, range 12, west of the sixth meridian. Survey of the east outlines of townships 76, ranges 7, 8, 9 and 10, west of the sixth meridian.
McGrandle, H.	Wetaskiwin, Alta.	Contract No. 37 of 1912. Subdivision of township 52, range 25, and parts of townships 49 and 50, range 24, and township 50, range 25, west of the fifth meridian.



## SESSIONAL PAPER No. 25b

APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1912, to March 31, 1913—*Continued.*

Surveyor.	Address.	Description of Work.
McMillan, Geo.. . . .	Finch, Ont.. . . . .	Survey of the twentieth base line across ranges 10 to 26, west of the fourth meridian.
McNaughton, A. L....	Cornwall, Ont.. . . .	Subdivision survey in townships 46 and 47, range 19, township 47, range 20, townships 47 and 48, range 22, and townships 46 and 47, range 23, west of the fifth meridian. Mounding in townships 48, ranges 20 and 21, west of the fifth meridian.
Neelands, R.. . . .	Hamiota, Man.. . . .	Contract No. 6 of 1912. Subdivision of township 29, range 1, townships 28 and 29, range 2, and township 29, range 3, west of the principal meridian. Survey of timber berth No. 1877 in townships 24 and 25, range 4, and township 25, range 5, east of the principal meridian.
Neville, E. A.. . . .	Ruthven, Ont.. . . .	Settlement surveys at Chipewyan, Smith Landing and Fort Smith.
Palmer, P. E.. . . .	Dorchester, N.B.. . . .	Contract No. 12 of 1912. Subdivision of townships 32 and 33, range 14, township 33, range 15, and the south two-thirds of townships 34, ranges 14 and 15, west of the principal meridian.
Pierce, J. W.. . . .	Ottawa, Ont.. . . . .	Contract No. 25 of 1912. Subdivision of township 56, range 15, townships 55, 56, 57, 58, and the north third of township 54, range 16, west of the third meridian.
Plunkett, T. H.. . . .	Meaford, Ont.. . . . .	Production of the tenth base line across ranges 6 to 14 and parts of ranges 5 and 15, the eleventh base line across ranges 16 to 24 and part of range 25, the twelfth base line across ranges 17 to 24 and part of range 16, the thirteenth base line across ranges 28 to 32, and the fourteenth base line across ranges 28 to 31, west of the principal meridian. Also the thirteenth base line across ranges 1 to 4, west of the second meridian. Survey of the east outlines of townships 34, 35 and 36, ranges 8 and 15, west of the principal meridian. Subdivision in township 33, range 15, west of the principal meridian.
Proudfoot, H. B.. . .	Saskatoon, Sask.. . . .	Contract No. 23 of 1912. Subdivision of township 56, range 12, and townships 53, 54, 55 and 56, range 13, west of the third meridian.
Purser, R. C.. . . .	Windsor, Ont.. . . . .	Subdivision in township 32, range 10, west of the third meridian. Resurvey in township 46, range 19, and township 43, range 28, west of the second meridian; township 36, range 19, west of the third meridian. Correction survey in township 38, range 19, west of the second meridian. Retracement surveys in township 47, range 19, and township 46, range 20, west of the second meridian; township 39, range 1, township 34, range 3, township 49, range 5, township 47, range 16, townships 53 and 54, range 22, township 54, range 23, and township 53,



APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1912, to March 31, 1913—*Continued.*

Surveyor.	Address.	Description of Work.
		range 26, west of the third meridian. Traverse in townships 33 and 49, range 6, township 48, range 15, township 53, range 22, and township 54, range 23, west of the third meridian. Investigation and restoration survey in townships 37 and 38, range 26, west of the third meridian; township 60, range 25, and township 50, range 28, west of the fourth meridian.
Ransom, J. F.. . . .	Toronto, Ont.. . . .	Contract No. 14 of 1912. Subdivision of township 52, range 7, and townships 50 and 51, range 8, west of the second meridian. Survey of the east outline of township 52, range 8, and the north boundary of township 51, range 7, west of the second meridian.
Rinfret, C.. . . .	Montreal, Que.. . . .	Resurvey in townships 12 and 13, range 28, and townships 13 and 14, range 29, west of the second meridian. Correction survey in township 14, range 30, west of the second meridian; townships 14, ranges 1 and 10, west of the third meridian. Restoration survey in townships 14 and 15, ranges 23 and 24, and townships 15, ranges 25 and 26, west of the third meridian. Retracement survey in townships 13 and 14, ranges 23 and 24, township 13, range 25, and township 14, range 26, west of the second meridian; townships 12, 13 and 14, range 1, and townships 13 and 14, range 2, west of the third meridian. Investigation in townships 34, ranges 14 and 16, townships 32 and 35, range 17, and townships 32 and 33, range 18, west of the second meridian. Traverse in township 34, range 16, townships 32, ranges 17 and 18, townships 12, 13 and 14, range 28, townships 13 and 14, range 29, and township 14, range 30, west of the second meridian; townships 14 and 15, range 24, west of the third meridian.
Robinson, E. W.. . . .	Ottawa, Ont.. . . .	Production of the second meridian from the northeast corner of section 1, township 63 to the northeast corner of township 83. Mounding along second meridian from northeast corner of townships 62 to the northeast corner of section 1, township 68.
Robinson, W. A.. . . .	Winnipeg, Man.. . . .	Contract No 24 of 1912. Subdivision of townships 54, 55 and 56, range 14, and townships 54 and 55, range 15, west of the third meridian.
Rolfson, O.. . . .	Walkerville, Ont... . .	Survey of the fifteenth base line across ranges 1 to 3 and part of range 4, the sixteenth base line across ranges 1 to 25, and the seventeenth base line across ranges 1 to 5, west of the principal meridian.
Roy, J. E.. . . .	Quebec, Que.. . . .	Contract No. 22 of 1912. Subdivision of townships 55 and 56, range 11, and townships 53, 54 and 55, range 12, west of the third meridian.



## SESSIONAL PAPER No. 25b

APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1912, to March 31, 1913—*Continued.*

Surveyor.	Address.	Description of Work.
Saint Cyr, A. . . . .	Ottawa, Ont. . . . .	Survey of the third meridian from the seventh to the eighteenth base line and of the eighteenth base line from the third to the fourth meridian.
Segré, B. H. . . . .	Davidson, Sask. . . . .	Subdivision in townships 18, ranges 29 and 30, west of the second meridian. Restoration survey in township 28, range 18, and township 27, range 19, west of the second meridian; township 46, range 3, west of the third meridian. Resurvey in township 26, range 2, west of the second meridian; township 25, range 3, west of the third meridian. Correction survey in townships 23, 24 and 28, range 27, west of the second meridian; township 16, range 1, and township 18, range 17, west of the third meridian. Retracement survey in townships 30 and 31, ranges 26 and 27, and townships 16, ranges 29 and 30, west of the second meridian.
Seibert, F. V. . . . .	Rush Lake, Sask. . . . .	Subdivision in township 7, range 30, west of the second meridian; township 7, range 1, and townships 16 and 17, ranges 10 and 11, west of the third meridian. Resurvey in township 11, range 12, and township 16, range 13, west of the third meridian; townships 2 and 3, range 15, west of the fourth meridian. Correction survey in township 24, range 25, west of the second meridian; township 26, ranges 13 and 20, west of the third meridian; township 38, range 11, township 24, range 12, townships 26, 27 and 43, range 14, and townships 26 and 27, range 15, west of the fourth meridian. Retracement survey in township 27, range 14, west of the second meridian; townships 19 and 20, range 15, and townships 17 and 18, range 17, west of the third meridian. Restoration survey in townships 2 and 3, range 14, west of the fourth meridian. Traverse in township 26, range 7, and townships 16, ranges 16, 17 and 21, west of the third meridian; township 8, range 3, township 38, range 11, and townships 48 and 49, ranges 22 and 23, west of the fourth meridian; township 8, range 5, west of the fifth meridian. Contour survey at Elkwater lake in township 8, range 3, west of the fourth meridian.
Soars, H. M. R. . . . .	Edmonton, Alta. . . . .	Contract No. 4 of 1912. Subdivision of townships 69, 70 and 71, ranges 22 and 24, townships 69 and 70, ranges 23 and 25, and the south two-thirds of township 71, range 23, west of the fifth meridian. Survey of the east outlines of townships 72, ranges 22, 23, 24 and 25, and townships 71 and 72, range 26, west of the fifth meridian.
Starkey, S. M. . . . .	Cody's, N.B. . . . .	Contract No. 26 of 1912. Subdivision of townships 59, 60, 61 and 62, range 16, and township 61, range 17, west of the third meridian.



APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1912, to March 31, 1913—*Continued.*

Surveyor.	Address.	Description of Work.
Steele, I. J.. . . .	Ottawa, Ont.. . . .	Contract No. 32 of 1912. Subdivision of townships 61, 62 and 63, range 23, townships 63, 64 and the north third of township 62, range 24, west of the third meridian. Survey of the east outline of township 64, range 23, west of the third meridian.
Stewart, A. G.. . .	Edmonton, Alta.. . . .	Contract No. 3 of 1912. Subdivision of township 81, range 18, the south two-thirds of township 82 and part of township 81, range 19, townships 82 and 83, range 20, townships 84, ranges 22, 23, 24, 25 and 26, west of the fifth meridian; townships 80, ranges 1 and 2, west of the sixth meridian. Survey of the east outlines of township 84, range 20, and township 81, range 21, west of the fifth meridian.
Stewart, N. C.. . .	Ottawa, Ont.. . . .	Subdivision in townships 28, ranges 17 and 18, townships 28 and 29, ranges 22 and 23, township 31, range 25, and townships 31 and 32, range 26, west of the fifth meridian; townships 18 and 19, range 7, townships 18 and 20, range 8, township 19, range 9, and townships 17, 18 and 19, range 10, west of the sixth meridian. Resurvey in townships 28, ranges 17 and 18, townships 28 and 29, ranges 22 and 23, and townships 27, ranges 25 and 26, west of the fifth meridian; townships 18, ranges 7 and 8, townships 18, 19 and 20, range 9, and township 17, range 10, west of the sixth meridian. Traverse in townships 28, ranges 17 and 18, townships 27 and 28, range 22, townships 28 and 29, range 23, townships 27 and 31, range 25, and townships 27, 31 and 32, range 26, west of the fifth meridian; township 18, range 7, and township 17, range 10, west of the sixth meridian.
Stewart, W. M.. . .	Saskatoon, Sask.. . . .	Contract No. 28 of 1912. Subdivision of townships 63 and 64, range 16, and townships 62, 63 and 64, range 17, west of the third meridian.
Stock, J. J.. . . .	Ottawa, Ont.. . . .	Contract No. 35 of 1912. Subdivision of townships 64 and 65, range 3, and townships 63 and 64, range 4, west of the fifth meridian.
Street, P. B.. . . .	Toronto, Ont.. . . .	Subdivision in townships 11 and 12, range 2, townships 10, 11 and 12, range 3, townships 10 and 11, range 4, and townships 10, 11, 12 and 13, range 5, west of the fifth meridian. Retracement survey in townships 5, ranges 17 and 18, and township 2, range 19, west of the fourth meridian.
Stuart, A. G.. . . .	Buckingham, Que.. . .	Retracement of the principal meridian from the international boundary to the eighth base line. Resurvey of township 21, range 4, west of the principal meridian. Correction survey in townships 31, ranges 8 and 9, west of the principal meridian. Traverse of Swan lake in townships 21, ranges 5 and 6, west of the principal meridian.



SESSIONAL PAPER No. 25b

APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1912, to March 31, 1913—*Continued.*

Surveyor.	Address.	Description of Work.
Taggart, C. H..	.. Ottawa, Ont..	.. Subdivision in township 21, range 12, townships 21 and 25, range 13, townships 23, 24 and 25, range 14, townships 20, 21, 22, 23 and 24, range 15, townships 22 and 23, range 16, townships 17, 21 and 22, range 17, and township 18, range 18, west of the sixth meridian. Resurvey in township 21, range 13, townships 24, ranges 14 and 15, township 22, range 16, and townships 17 and 21, range 17, west of the sixth meridian. Traverse in townships 24 and 25, range 14, townships 22 and 24, range 15, township 22, range 16, and townships 17 and 21, range 17, west of the principal meridian.
Taylor, W. E..	.. Owen Sound, Ont..	.. Contract No. 10 of 1912. Subdivision of townships 29, 30, 31 and 32, range 11, township 32, range 12, and the portions of townships 30 and 31, range 12, east of lake Manitoba, west of the principal meridian.
Tipper, G. A..	.. Brantford, Ont..	.. Contract No. 2 of 1912. Subdivision of townships 84 and 85 and the south two-thirds of township 82, range 2, townships 82, 83, 84 and 85, range 3, and townships 81, 82, 83 and 84, range 4, west of the sixth meridian.
Tremblay, A. J..	.. Edmonton, Alta..	.. Contract No. 33 of 1912. Subdivision of township 88 and the south two-thirds of township 89, range 8, townships 88, 89 and part of township 90, range 9, and township 88 and the south two-thirds of township 89, range 10, west of the fourth meridian.
Waddell, W. H..	.. Edmonton, Alta..	.. Contract No. 29 of 1912. Subdivision of townships 61, 62 and 63, range 18, townships 61 and 62, range 19, west of the third meridian. Survey of the east outlines of townships 64, ranges 18 and 19, west of the third meridian.
Walker, C. M..	.. Guelph, Ont..	.. Retracement survey of townships 1 and 2, range 6, west of the fourth meridian. Survey of cemetery and villa lots at Banff.
Wallace, J. N..	.. Calgary, Alta..	.. Levelling along Canadian Northern railway from Hudson Bay Junction to Islay, and also from Edmonton to Athabaska Landing and westerly along Athabaska river.



## APPENDIX No. 2.

SCHEDULE showing for each surveyor employed from April 1, 1912, to March 31, 1913, the number of miles surveyed of township section lines, township outlines, traverses of lakes and rivers and resurvey, also the cost of the same.

Surveyor.	Miles of section.	Miles of outline.	Miles of traverse.	Miles of resurvey.	Total mileage.	Total cost.	Cost per mile.	Day work or contract.
						\$	\$ cts.	
Akins, J. R.		154		10	164	25,208	153 71	Day.
Allison, C. B.	222	24	197		443	7,888	17 81	Contract.
Aylsworth, C. F.			19	159	178	10,238	57 52	Day.
Bennett, G. A.	2		20	145	167	5,657	33 88	"
Berry, E. W.	159	44	61		264	10,300	39 02	"
Blanchet, G. H.		126			126	16,897	134 10	"
Bowman, E. P.	175	6	25		206	6,118	29 70	Contract.
Brenot, L.	170	47	52		269	19,408	72 15	Day.
Calder, J. A.	48		73	6	127	7,729	60 86	"
Campbell, A. S.			80	138	218	6,775	31 03	"
Christie, W.	200	26	194		420	8,854	21 08	Contract.
Cowper, G. C.			75	348	426	8,701	20 42	Day.
Cummings, A. L.	252	18	89		359	8,284	23 08	Contract.
Davies, T. A.	259	35	103		399	9,844	24 67	"
Day, H. S.	174	12			186	5,743	30 88	"
Evaus, S. L.	17	8	45	275	345	8,645	25 06	Day.
Fairchild, C. C.	192		6		198	5,946	30 03	Contract.
Fawcett, A.	269	23	108		400	8,827	22 07	"
Francis, J.	323	6	3	36	368	9,357	25 42	"
Galletly, J. S.	278	55	74		407	18,942	46 54	Day.
Gibbon, Jas.	170	16	5		191	5,766	30 18	Contract.
Grassie, C. A.	85		71	6	162	9,610	59 32	Day.
Hawkins, A. H.		163			163	25,272	155 04	"
Herriot, G. H.		70			70	11,055	157 93	"
Jackson, J. E.	214	12	56	12	294	7,715	26 24	Contract.
Lighthall, A.	12		61	2	75	9,207	122 76	Day.
Loucks, R. W. E.	242	48	41		331	9,159	27 67	Contract.
Martindale, E. S.	58	3	11	117	189	11,140	58 94	Day.
Martyn, O. W.	176	12	7		195	5,816	29 82	Contract.
Matheson, H.	42	4	2		48	10,785	224 69	Day.
Melhuish, P.	26		55	3	84	9,213	109 68	"
Molloy, J.	268	34	159		461	10,768	23 36	Contract.
Montgomery, R. H.	230	24	58		312	8,359	26 79	"
Morrier, J. F.	230	26	72		328	8,853	26 99	"
MacLennan, A. L.	176	34	26		236	6,589	27 92	"
McEwen, D. F.	244	48	119		411	9,363	22 78	"
McFarlane, J. B.		65			65	18,632	286 64	Day.
McFarlane, W. G.	463	74	35		572	15,694	27 44	Contract.
McGrandle, H.	112		6		120	3,873	32 27	"
McMillan, Geo.		101			101	19,048	188 59	Day.
McNaughton, A. L.	112	22	21		155	11,466	73 97	"
Neelands, R.	200	18	11		229	6,624	28 92	Contract.
Neville, E. A.			71	8	79	7,013	88 77	Day.
Palmer, P. E.	165	21	63		249	6,206	24 92	Contract.
Pierce, J. W.	256	30	12		298	8,741	29 33	"
Plunkett, T. H.	4	273			277	33,950	122 56	Day.
Proudfoot, H. B.	111	6	20		137	3,536	25 81	Contract.
Purser, R. C.	16		19	70	105	5,397	51 40	Day.
Ransom, J. T.	102	16	76		194	4,085	21 06	Contract.
Rinfret, C.			62	567	629	7,976	12 68	Day.
Robinson, E. W.		96			96	23,165	241 30	"
Robinson, W. A.	240	32	4		276	8,563	31 03	Contract.
Rolfson, O.		199			199	19,257	96 76	Day.
Roy, J. E.	192	30	43		265	6,775	25 56	Contract.
Saint Cyr, A.		181			181	29,991	165 69	Day.
Segre, B. H.	13			38	51	2,486	48 74	"
Seibert, F. V.	39		26	100	165	6,152	27 59	"
Soars, H. M. R.	506	112	72		690	19,971	28 94	Contract.
Starkey, S. M.	230	18	196		444	7,298	16 44	"
Steele, I. J.	253	52	158		463	10,978	23 71	"
Stewart, A. G.	471	65	56		592	17,244	29 13	"



## SESSIONAL PAPER No. 25b

APPENDIX No. 2—*Concluded.*

SCHEDULE showing for each surveyor employed from April 1, 1912, to March 31, 1913; the number of miles surveyed, &c.—*Concluded.*

Surveyor.	Miles of section.	Miles of outline.	Miles of traverse.	Miles of resurvey.	Total mileage.	Total cost.	Cost per mile.	Day work or contract.
						\$	\$ cts.	
Stewart, N. C.....	89	.....	52	12	153	9,320	60 91	Day.
Stewart, W. M.....	246	30	97	.....	373	7,236	19 40	Contract.
Stock, J. J.....	188	6	79	.....	273	7,235	26 50	"
Street, P. B.....	76	8	8	73	165	8,915	54 03	Day.
Stuart, A. G.....	.....	.....	8	226	234	8,744	37 37	"
Taggart, C. H.....	112	.....	15	9	136	9,638	70 87	"
Taylor, W. E.....	203	19	65	.....	287	7,111	24 77	Contract.
Tipper, G. A.....	509	62	32	.....	603	17,409	28 87	"
Tremblay, A. J.....	299	48	85	.....	432	13,777	31 89	"
Waddell, W. H.....	245	54	137	.....	436	10,277	23 57	"
Walker, C. M..	.....	.....	8	226	234	9,848	42 09	Day.
Total.....	10,365	2,718	3,509	2,586	19,178	781,662		

## APPENDIX No. 3.

LIST of lots in the Yukon Territory, survey returns of which have been received from April 1, 1912, to March 31, 1913.

## GROUP 2.

Lot No.	Acres.	Surveyor.	Year of Survey.	Date of Approval.	Claimant.	Remarks.
339	49·53	F. H. Kitto .....	1912	Dec. 6, 1912...	Otto J. Kastner... ..	Omenecia M. C.
347	80·9	" .....	1911	Dec. 6, 1912...	Malcolm McLaren.....	Surface.
350	40·00	C. W. MacPherson	1912	Nov. 13, 1912...	A. B. Devlin.....	Surface.

## GROUP 6.

121	51·65	H. G. Dickson....	1912	Nov. 13, 1912...	W. J. Fleming.....	Empire No. 2 M. C.
122	31·28	" .....	1912	Jan. 10, 1913...	" .....	Black Rock M. C.
123	20·08	" .....	1912	Jan. 10, 1913...	" .....	Suburban M. C.



## APPENDIX No. 4.

LIST of miscellaneous surveys in the Yukon Territory, returns of which have been received from April 1, 1912, to March 31, 1913.

Year.	Surveyor.	Description of Survey.
1908	James Gibbon	Base line of Barker Creek, a tributary of Stewart River.
1908	"	" " 51 Pup, a tributary of Barker Creek.
1908	"	" " McRae Creek, a tributary of Barker Creek.
1908	"	" " Agate Creek, a tributary of Barker Creek.
1908	"	" " Preacher Creek, a tributary of Barker Creek.
1908	"	" " Iron Creek, a tributary of Barker Creek.
1908	"	Stewart River reference traverse from Stewart crossing to Barker Creek.
1912	F. H. Kitto	Base line of Scroggie Creek, a tributary of Stewart River.
1912	"	" " Wallhalla Creek, a tributary of Scroggie Creek.
1912	"	" " Alberta Creek, a tributary of Scroggie Creek.
1912	"	" " Sharpe Creek, a tributary of Scroggie Creek.
1912	"	" " Mariposa Creek, a tributary of Scroggie Creek.
1912	"	" " Stevens Creek, a tributary of Scroggie Creek.
1912	"	" " Clarke Creek, a tributary of Scroggie Creek.
1912	"	Amended survey of lower part of the Sulphur Creek base line.
1912	"	Timber berth No. 143 and part of No. 119 on Klondike River.
1912	"	Tie of Astronomical Pier at Tantalus to Carmack's reference traverse.

## APPENDIX No. 5.

STATEMENT of work executed in the office of the Chief Draughtsman:—

Letters of instruction to surveyors.....	315
Progress sketches received and filed.....	1,372
Declarations of settlers received and filed.....	176
Returns of timber berths received.....	13
Plans received from surveyors.....	254
Field books received from surveyors.....	635
Timber reports received.....	210
Observations for magnetic declination received.....	931
Miscellaneous returns received.....	168
Preliminary township plans prepared.....	334
Sketches made.....	6,020
Maps and tracings made.....	434
Plans of Yukon lots received.....	6
Plans of miscellaneous Yukon surveys received.....	17
Returns of surveys examined—	
Township subdivision.....	233
Township outline.....	274
Road plans.....	341
Railway plans.....	155
Yukon lots.....	6
Miscellaneous Yukon surveys.....	17
Mineral claims.....	18
Timber berths.....	25
Correction and other miscellaneous surveys.....	184



## SESSIONAL PAPER No. 25b

APPENDIX No. 5—*Concluded.*STATEMENT of work executed in the office of the Chief Draughtsman—*Concluded.*

Township plans compiled. . . . .	700
Townsite settlement and other plans compiled. . . . .	87
Proofs of plans examined. . . . .	53
Township plans printed. . . . .	517
Townsite and settlement plans printed. . . . .	9
Miscellaneous plans printed. . . . .	153
Areas calculated. . . . .	940
Pages of field notes copied. . . . .	363
Applications for various information dealt with. . . . .	1,727
Files received and returned. . . . .	1,345
Letters and memoranda drafted. . . . .	10,301
Books received from Record Office and used in connection with office work. . . . .	3,632
Books returned to Record Office. . . . .	4,273
Plans other than printed township plans received from Record Office and used in connection with office work. . . . .	723
Plans returned to Record Office. . . . .	1,104
Volumes of plans received from Record Office and used in connection with office work. . . . .	86
Volumes of plans returned to Record Office. . . . .	83
Books sent to Record Office to be placed on record. . . . .	433
Plans other than township plans sent to Record Office to be placed on record. . . . .	138
Sectional maps (3 miles to 1 inch)—	
Revised. . . . .	43
Reprinted. . . . .	46
Sectional maps (6 miles to 1 inch)—	
Reprinted. . . . .	33



## APPENDIX No. 6.

List of new editions of Sectional Maps issued from April 1, 1912, to March 31, 1913.

Scale—3 miles to one inch.

No.	Name.	No.	Name.	No.	Name.	No.	Name.
14	Pincer Creek.....	111	Kamloops .....	215	Red Deer.....	316	Vermilion.
16	Milk River.....	112	Sicamous.....	217	Tramping Lake.....	317	Fort Pitt.
17	Cypress.....	114	Calgary .....	218	Saskatoon.....	364	Fort Assiniboine.
19	Willowbunch .....	115	Blackfoot.....	219	Humboldt .....	365	Victoria.
20	Souris.....	116	Rainy Hills.....	222	Waterhen .....	366	Saddle Lake.
22	Dufferin.....	117	Red Deer Forks .....	262	Yellowhead.....	367	Meadow Lake.
24	Lake of the Woods..	118	Rush Lake .....	263	Jasper.....	368	Green Lake.
64	Porcupine.....	161	Morley .....	264	Brazeau.....	412	Wapiti.
66	Medicine Hat.....	166	Sounding Creek.....	265	Peace Hills.....	416	La Biche.
67	Maple Creek.....	167	Bad Hills.....	267	Battleford.....	464	Giroux.
69	Moosejaw.....	168	The Elbow.....	268	Carlton .....	513	Heart River.
70	Moose Mountain.....	169	Touchwood .....	314	St. Ann.		
74	Cross Lake.....	171	Duck Mountain.....	315	Edmonton.		

Scale—6 miles to one inch.

16	Milk River.....	74	Cross Lake.....	213	Athabaska.....	315	Edmonton.
17	Cypress.....	111	Kamloops .....	217	Tramping Lake.....	316	Vermilion.
19	Willowbunch.....	112	Sicamous .....	218	Saskatoon .....	317	Fort Pitt.
20	Souris.....	116	Rainy Hills.....	222	Waterhen .....	366	Saddle Lake.
22	Dufferin .....	117	Red Deer Forks .....	264	Brazeau.....	412	Wapiti.
24	Lake of the Woods..	163	Rosebud .....	266	Ribstone Creek.....	462	Dunvegan.
64	Porcupine.....	167	Bad Hills.....	268	Carlton.		
67	Maple Creek .....	169	Touchwood .....	313	Brulé.		



## SESSIONAL PAPER No. 25b

## APPENDIX No. 7.

STATEMENT of work executed in the Photographic office from April 1, 1912, to March 31, 1913.

—	3½ x 3½	3¼ x 5½	5 x 7	8 x 10	10 x 12	11 x 14	15 x 18	16 x 18	18 x 20	20 x 24	24 x 30	24 x 32	24 x 35	30 x 36	32 x 42	36 x 42	42 x 48	Total.
Dry plates and films.....	12	659	625	17	15	353	105	105	25	112	77	.....	.....	.....	.....	.....	.....	1,328
Bromide prints.....	.....	2	12	104	14	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	43	17	956
Solo prints.....	.....	31	361	344	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	739
Velox prints.....	.....	5,874	4,387	19	78	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10,358
Artura prints.....	.....	.....	62	62	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	62
Vandyke prints.....	.....	.....	9	6	84	3	31	31	73	94	246	.....	.....	.....	.....	.....	.....	963
Blue prints.....	.....	.....	14	53	36	60	277	277	158	130	168	.....	.....	.....	.....	.....	.....	1,342
Lantern transparencies.....	181	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	181
Photographs mounted.....	.....	18	36	34	8	.....	1	.....	170	79	.....	.....	.....	.....	.....	.....	.....	97
Wet plate negatives.....	.....	.....	.....	99	228	744	.....	.....	155	52	.....	55	126	.....	.....	.....	.....	1,375
Photo-litho plates.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	194	.....	.....	527
Total.....	193	6,584	5,444	738	135	747	744	414	581	467	491	55	126	634	194	319	62	17,928



## APPENDIX No. 8.

STATEMENT of work executed in the Lithographic Office from April 1, 1912, to March 31, 1913.

MONTH.	MAPS.			TOWNSHIP PLANS.			FORMS.		
	No.	Copies.	Impres- sions.	No.	Copies.	Impres- sions.	No.	Copies.	Impres- sions.
1912.									
April.....	11	7,675	19,675	22	4,400	5,000	1	200	400
May.....	11	5,000	14,975	55	11,000	11,200	6	8,287	8,587
June.....	20	13,900	28,900	70	14,000	14,400	1	2,000	2,000
July.....	10	9,375	25,225	17	3,400	4,000	2	900	1,400
August.....	27	12,850	13,225	30	6,000	6,600	1	1,000	1,000
September.....	15	6,900	6,900	89	17,800	18,600	1	700	700
October.....	14	6,190	6,190	9	1,800	2,200	3	4,000	4,000
November.....	2	325	325	11	2,200	2,200	1	600	600
December.....	5	2,500	2,500	42	8,400	8,400	2	1,013	1,013
1913.									
January.....	11	32,215	135,045	73	14,600	14,800	5	21,000	23,000
February.....	6	2,725	2,725	40	8,000	8,000	6	9,500	9,500
March.....	9	2,000	2,500	93	18,600	19,000	3	5,300	5,400
Total.....	141	101,655	253,185	551	110,200	114,400	32	54,550	57,600

## RECAPITULATION.

	No.	Copies.	Impressions.	Cost.
—				\$
Maps.....	141	101,655	253,185	2,706 66
Township plans.....	551	110,200	114,400	4,088 00
Forms.....	32	54,550	57,600	617 34
Grand total.....	724	266,405	430,185	7,412 00



## SESSIONAL PAPER No. 25b

List of employees of the Topographical Surveys Branch at Ottawa, giving the name, classification, duties of office and salary of each. (Metcalf street, corner of Slater.)

NAME.	CLASSIFICATION.		Duties of Office.	Salary.
	Division.	Sub-division.		
				\$
Deville, E., D.T.S., LL.D.....	1	A	Surveyor General.. . . .	3,750
	Correspondence.			
Brady, M.....	1	B	Secretary.....	2,500
Cullen, M. J.....	3	A	Stenographer.....	1,200
Moran, J. F.....	3	A	Clerk.....	950
Williams, E. R.....	3	A	Correspondence clerk.....	950
Addison, W. G.....	3	B	Typewriter.....	800
Renault, J. F.....	3	B	".....	700
Pegg, A.....			Messenger.....	800
O'Meara, M. T.....			".....	600
	Accounts.			
Hunter, R. H.....	2	A	Accountant.....	2,100
Lemay, A.....	2	A	Asst. Accountant.....	1,600
Wilkinson, Percy.....	3	A	".....	1,150

Chief Draughtsman's Office (Metcalf street, corner of Slater)—General Direction and Supervision of the Technical Work.

Shanks, T., B.A.Sc., D.L.S.....	1	B	Chief draughtsman.....	2,650
Brown, T. E., B.A.....	1	B	Asst. chief draughtsman.....	2,650

Chief Draughtsman's Office, First Section (Metcalf street, corner of Slater)—Survey instructions and general information.

Barber, H. G., Grad. S.P.S.....	2	A	Chief of section.....	1,950
Rice, F. W., Grad. School of Mining...	2	A	Asst. chief of section.....	1,950
MacIlquham, W. L., B.Sc.....	2	A	" ".....	1,950
Weld, W. E.....	2	A	" ".....	1,950
Peaker, W. J., Grad. S.P.S.....	2	A	" ".....	1,650
Carroll, M. J., Grad. S.P.S.....	2	A	" ".....	1,600
Rochon, E. C.....	2	A	" ".....	1,600
McRae, A. D., B.A., B.Sc.....	2	B	Draughtsman.....	1,450
Grant, A. W., B.A.....	2	B	".....	1,450
Hayward, H. E., B.Sc.....	2	B	".....	1,350
MacMillan, J. P., B.E.....	2	B	".....	1,350
Wadlin, L. N., B.Sc.....	2	B	".....	1,250
Cordukes, J. P., B.Sc.....	2	B	".....	1,250
Gagnon, J. N. H., B.A.S.....	2	B	".....	1,100
Armstrong, W. B., B.Sc.....	2	B	".....	1,250
Nevins, L. A., B.A.....	2	B	".....	1,250
McDonald, J. F., B.A.....	2	B	".....	1,250
Sammon, J. J., B.A.....	2	B	".....	1,200
Fleming, A. C., B.A.....	2	B	".....	1,200
Kydd, Geo., B.Sc.....	2	B	".....	1,200
Quinlan, L. J., B.A.Sc.....	2	B	".....	1,200
Mills, T. S., B.A., B.Sc.....	2	B	".....	1,200
Holbrook, C. H.....	3	A	Clerk.....	1,000
Burkholder, E. L.....	3	A	".....	950



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Chief Draughtsman's Office, Second Section (Metcalf street, corner of Slater)—  
Surveys in Manitoba, Saskatchewan, Alberta and Yukon Territory.

Name.	Classification.		Duties of Office.	Salary.
	Division.	Sub-division.		
				\$
Nash, T. S., Grad. S.P.S., D.L.S. ....	1	B	Chief of section.....	2,650
Dennis, E. M., B. Sc. ....	2	A	Asst. chief of section.....	1,950
Elder, A. J., Grad. S.P.S., D.L.S. ....	2	A	" " .....	1,950
Hill, S. N., Grad. S.P.S. ....	2	A	" " .....	1,950
Genest, P. F. X., Q.L.S. ....	2	A	" " .....	1,950
Kitto, F. H., D.L.S. ....	2	A	In charge of Dawson office...	1,650
Sutherland, H. E., B.Sc. ....	2	A	Asst. chief of section.....	1,600
McClennan, W. D. ....	2	A	" " .....	1,600
Roger, A., O.L.S. ....	2	A	" " .....	1,600
Spreckley, R. O. ....	2	B	Draughtsman.....	1,550
Goodday, Leonard. ....	2	B	" .....	1,450
Bray, R. P. ....	2	B	" .....	1,450
Harrison, E. W. ....	2	B	" .....	1,350
Ault, H. W. ....	2	B	" .....	1,350
Lytle, W. J. ....	2	B	" .....	1,100
LaBeree, E. E. ....	2	B	" .....	1,100
Jones, G. S., Grad. S.P.S., O.L.S. ....	2	B	" .....	1,100
Bradley, J. D. ....	2	B	" .....	1,100
Fournier, O. E., B.A.S. ....	2	B	" .....	1,100
Thomas, A. S., B.Sc. ....	2	B	" .....	1,250
Kirwan, A. L., B.A.Sc. ....	2	B	" .....	1,200
Robinson, S. D., B.Sc. ....	2	B	" .....	1,200
Macdonald, J. A. ....	3	B	Clerk.....	800

Chief Draughtsman's Office, Third Section—(Imperial Building, Queen street):  
Copying plans for reproduction.

Engler, Carl., B. A., D.L.S. ....	1	B	Chief of section.....	2,200
May, J. E. ....	2	A	Asst. chief of section.....	1,950
O'Connell, J. R. ....	2	A	" " .....	1,750
Moule, W. J. ....	2	B	Draughtsman.....	1,600
Helmer, J. D. ....	2	B	" .....	1,150
Dawson, R. J. ....	2	B	" .....	1,150
Archambault, E. ....	2	B	" .....	1,150
Clarke, G. N. ....	2	B	" .....	800
Watters, James. ....	3	A	Printer.....	1,200
McLennan, A. G. ....	3	A	Clerk.....	1,200
Brown, A. ....	3	A	" .....	950
Ebbs, E. J. ....	3	A	" .....	950
Baril, C. ....	3	B	Draughtsman.....	800

Chief Draughtsman's Office, Fourth Section—(Imperial Building, Queen street).  
British Columbia surveys.

Rowan-Legg, E. L. ....	2	A	Chief of section.....	2,100
Gilmore, E. T. B., Grad. R.M.C. ....	2	A	Asst. chief of section.....	2,050
Morley, R. W. ....	2	A	" " .....	1,950
Wilson, E. E. D., B. Sc. ....	2	A	" " .....	1,650
Harris, K. D. ....	2	B	Draughtsman.....	1,350



## SESSIONAL PAPER No. 25b

Chief Draughtsman's Office, Fifth Section—(Imperial Building, Queen street).  
Mapping.

Name.	Classification.		Duties of Office.	Salary
	Division.	Sub-division.		
				\$
Smith, J. ....	1	B	Chief of section.....	2,650
Begin, P. A. ....	2	A	Asst. chief of section.....	2,000
Blanchet, A. E. ....	2	A	" " .....	1,600
Côté, J. A., Grad. R.M.C. ....	2	A	" " .....	1,650
D'Orsonnens, A. ....	2	A	" " .....	1,600
Flindt, A. H. ....	2	A	" " .....	1,750
Bergin, W. ....	2	B	Draughtsman .....	1,150
Blanchard, J. F. ....	2	B	" .....	1,100
Brigly, J. H. ....	2	B	" .....	1,350
Colquhoun, G. A., B.Sc. ....	2	B	" .....	1,250
Davies, T. E. S. ....	2	B	" .....	1,600
Davy, E. ....	2	B	" .....	1,450
Freeland, J. J., M.A. ....	2	B	" .....	1,250
Howie, Jas. ....	2	B	" .....	1,050
Perrin, V. ....	2	B	" .....	1,600
Purdy, W. A. ....	2	B	" .....	1,150
Villeneuve, E. ....	2	B	" .....	1,150

Chief Draughtsman's Office, Sixth Section—(Imperial Building, Queen street).  
Scientific and topographical work.

Dodge, G. B., D.L.S. ....	1	B	Chief of section.....	2,650
Watt, G. H., Grad. S.P.S., D.L.S. ....	2	A	Asst. chief of section.....	1,950
Cannell, H. W. ....	2	B	Draughtsman.....	1,200
Chartrand, D. E., B.Sc. ....	2	B	" .....	1,150
Cousineau, A., B.Sc. ....	2	B	" .....	1,150
Dozois, L. O. R., Grad. R.M.C. ....	2	B	" .....	1,150
Herbert, W. H., B.Sc. ....	2	B	" .....	1,250
Hill, Jas., M.A., B.Sc. ....	2	B	" .....	1,200
Hughson, W. G., B.Sc. ....	2	B	" .....	1,200
Milliken, J. B., B.A., B.Sc., D.L.S. ....	2	B	" .....	1,350
Parry, H., B.Sc., D.L.S. ....	2	B	" .....	1,050
Roe, B. J. ....	2	B	" .....	1,200
Ross, R. C., B.Sc. ....	2	B	" .....	1,250
Way, W. C., M.Sc. ....	2	B	" .....	1,200
Lynch, F. J. ....	3	B	Typewriter.....	800
Watson, J. W. ....	3	B	Clerk .....	800
Pick, A. C. ....			Messenger.....	550

## Geographic Board (Woods Building, Slater street).

Whitcher, A. H., F.R.G.S., D.L.S. ....	2	A	Secretary. ....	2,100
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## Photographic Office (Metcalf street, corner Slater street).

Carruthers, H. K. ....	2	A	Process photographer .....	1,950
Woodruff, John. ....	2	A	Chief " .....	1,950
Smith, L. G. ....	2	B	Photographer.....	850
Whitcomb, H. E. ....	3	A	" .....	1,200
Morgan, W. E. ....	3	A	" .....	1,200
Kilmartin, A. ....	3	A	Asst. photographer.....	950
Deylin, A. ....	3	B	" .....	800
Quimet, E. G. ....	3	B	" .....	800



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## Lithographic Office (unclassified) (Imperial Building, Queen street).

Name.	Occupation.	Salaries.
Moody, A. ....	Foreman .....	\$27 00 per week.
Burnett, E. ....	Lithographer.....	25 00 "
Thicke, C. R. ....	" .....	23 00 "
Deslauriers, J. H. ....	Transferrer .....	20 00 "
Bergin, J. ....	Printer .....	21 00 "
Thicke, H. S. ....	" .....	20 00 "
Boyle, S. ....	Stone polisher .....	15 00 "
Gagnon, J. ....	Press feeder .....	12 00 "
Kane, P. ....	" .....	9 50 "
Easton, R. M. ....	Printer .....	19 50 "
Hare, E. H. ....	Asst. photographer.....	15 00 "

## Chief Inspector of Surveys Office (98 Wellington street).

Name.	Classification.		Duties of Office.	Salaries.
	Division.	Sub-division.		
				\$
Hubbell, E. W., D.L.S. ....	1	B	Chief inspector.....	2,800
Sylvain, John .....	2	A	Assistant. ....	1,700
Stalker, Miss M. W. ....	3	A	Clerk.....	950

## Board of Examiners for D.L.S.

F. D. Henderson, Grad. S.P.S. ....	2	A	Secretary.....	1,950
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## SESSIONAL PAPER No. 25b

## APPENDIX No. 10.

List of Dominion Land Surveyors who are in possession of Standard Measures.

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Akins, James Robert.....	Ottawa, Ont.....	Sept. 2, '76	Mar. 14, '10	
Allison, Calvin Bruce.....	South Woodlee, Ont.....	June 16, '84	Mar. 28, '10	O.L.S.
Ashton, Arthur Ward.....	Ottawa, Ont.....	Nov. 5, '80	May 29, '08	B.C.L.S.
Austin, George Frederick.....	Not known.....		April 14, '72	
Aylen, John.....	North Bay, Ont.....		May 29, '85	
Aylsworth, Charles Fraser.....	Madoc, Ont.....	April 21, '62	May 13, '86	O.L.S.
Baker, James Clarence.....	Vermilion, Alta.....	May 12, '78	May 18, '06	A.L.S.
Baker, Mason Hermon.....	St. Thomas, Ont.....	July 9, '84	Aug. 6, '08	O.L.S.
Bartlett, Ernest.....	Medicine Hat, Alta.....		'83 Jan. 16, '11	A.L.S.
Bayne, George A.....	Winnipeg, Man.....	Oct. 25, '50	April 14, '72	M.L.S.
Beatty, David.....	Parry Sound, Ont.....	Dec. 22, '42	April 14, '72	O.L.S.
Begg, William Arthur.....	Hamilton, Ont.....	July 13, '82	June 8, '09	S.L.S.
Belanger, Phidime Roch Arthur	Ottawa, Ont.....	Mar. 5, '53	May 17, '80	Inspector of Surveys, Topographical Surveys Branch, Dept. of the Interior.
Belleau, Joseph Alphonse.....	Ottawa, Ont.....	Sept. 30, '56	May 15, '83	Land Patents Branch, Department of Interior.
Belyea, Albert Palmer Corey.....	Edmonton, Alta.....		July 14, '09	A.L.S.
Bemister, George Bartlett.....	Winnipeg, Man.....		June 11, '78	M.L.S. Engineering Dept. C.N.R.
Bennett, George Arthur.....	Calgary, Alta.....	May 18, '86	Aug. 25, '10	A.L.S.
Berry, Edward Wilson.....	Seaforth, Ont.....	Aug. 26, '81	May 18, '11	
Bigger, Charles Albert.....	Ottawa, Ont.....	Aug. 15, '53	Mar. 30, '82	B.C.L.S., O.L.S., Assistant Superintendent Geodetic Survey.
Bingham, Edwin Ralph.....	Fort William, Ont.....		'78 Oct. 25, '06	O.L.S.
Blanchet, Guy Houghton.....	Ottawa, Ont.....	Feb. 12, '84	Mar. 10, '10	
Boswell, Elias John.....	Montreal, Que.....		Mar. 18, '03	O.L.S., M.L.S.
Bourgeault, Armand.....	St. Jean Port Joli, Que.....	Feb. 23, '58	Mar. 29, '83	Q.L.S.
Bourgault, Charles Eugene.....	Lauzon, Levis, Que.....	Sept. 6, '61	Feb. 21, '88	
Bourget, Charles Arthur.....	Lauzon, Que.....	Aug. 26, '51	May 14, '84	Q.L.S.
Bowman, Edgar Peterson.....	West Montrose, Ont.....	Sept. 29, '83	Sept. 26, '07	O.L.S.
Bowman, Herbert Joseph.....	Berlin, Ont.....	June 18, '65	Feb. 16, '88	O.L.S.
Brabazon, Alfred James.....	Ottawa, Ont.....		May 13, '82	Boundary Survey, Dept. of the Interior.
Brady, James.....	Golden, B.C.....	Nov. 24, '40	April 14, '72	O.L.S., B.C.L.S.
Bray, Samuel.....	Ottawa, Ont.....	Nov. 5, '46	Nov. 14, '83	O.L.S., Chief Surveyor, Dept. of Indian Affairs.
Bray, Lennox Thomas.....	Edmonton, Alta.....	Mar. 14, '77	Feb. 18, '03	O.L.S., A.L.S.
Brenot, Lucien.....	Ottawa, Ont.....	Aug. 31, '87	Mar. 18, '10	
Bridgland, Morrison Parsons.....	Calgary, Alta.....	Dec. 20, '78	Mar. 10, '05	A.L.S.
Broughton, George Henry.....	Penticton, B.C.....	Aug. 12, '86	June 3, '09	B.C.L.S.
Brown, Charles Dudley.....	Winnipeg, Man.....	Feb. 25, '83	April 4, '10	A.L.S., S.L.S.
Brown, Edgar Carl.....	Regina, Sask.....	Nov. 28, '86	May 23, '11	A.L.S., S.L.S.
Brown, Thomas Wood.....	Regina, Sask.....		June 21, '09	A.L.S., S.L.S.
Brownlee, James Harrison.....	Vancouver, B.C.....	Mar. 22, '56	April 15, '87	M.L.S., B.C.L.S.
Buchanan, John Alexander.....	Edmonton, Alta.....	Mar. 4, '87	May 17, '12	A.L.S.
Burd, James Henry.....	Weyburn, Sask.....	Sept. 7, '71	May 18, '11	O.L.S., S.L.S.
Burgess, Edward LeRoy.....	Victoria, B.C.....	May 5, '78	Feb. 23, '05	O.L.S.
Burnet, Hugh.....	Victoria, B.C.....		June 22, '85	O.L.S., B.C.L.S.
Burwash, Nathaniel Alfred.....	Whitehorse, Y.T.....	Sept. 28, '79	Mar. 6, '07	O.L.S.
Burwell, Herbert Mahlon.....	Vancouver, B.C.....	Oct. 23, '63	Feb. 17, '87	B.C.L.S.
Calder, John Alexander.....	Lytton, B.C.....	June 2, '86	May 21, '12	
Campbell, Alan John.....	Sidney, B.C.....	Oct. 1, '82	April 13, '09	B.C.L.S., A.L.S.
Campbell, Alexander Stewart.....	Kingston, Ont.....	Mar. 7, '80	Mar. 6, '09	O.L.S.
Carbert, Joseph Alfred.....	Medicine Hat, Alta.....	Feb. 4, '56	May 12, '80	O.L.S., A.L.S., District Engineer and Surveyor, Dept. of Public Works, Alberta.
Carpenter Henry Stanley.....	Regina, Sask.....	Feb. 8, '74	Feb. 20, '01	O.L.S., S.L.S., Department of Public Works.
Carroll, Cyrus.....	Regina, Sask.....	Dec. 6, '34	April 14, '72	O.L.S., S.L.S.



## APPENDIX No. 10—Continued.

LIST of Dominion Land Surveyors who are in possession of Standard Measures.—  
Continued.

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Carson, Percy Alexander.....	Kamloops, B.C.....	Dec. 25, '77	Feb. 22, '06	Hydrographic Survey.
Carthew, William Morden.....	Edmonton, Alta.....	Oct. 19, '86	Mar. 29, '10	A.L.S.
Carthew, John Trewalla.....	Edmonton, Alta.....	Feb. 15, '91	Mar. 15, '13	
Cautley, Reginald Hutton.....	Edmonton, Alta.....	Dec. 6, '99	May 1, '05	A.L.S.
Cautley, Richard William.....	Edmonton, Alta.....	Aug. 3, '73	Sept. 2, '96	A.L.S.
Cavana, Allan George.....	Orillia, Ont.....	Jan. 22, '58	Nov. 16, '76	O.L.S.
Charlesworth, Lionel Clare.....	Edmonton, Alta.....	Nov. 17, '73	Mar. 24, '02	O.L.S., A.L.S., Dept. of Pub. Works, Alberta.
Chase, Albert Victor.....	Orillia, Ont.....	Mar. 4, '83	Oct. 11, '10	O.L.S.
Chilver, Charles Alonzo.....	Walkerville, Ont.....	Feb. 8, '83	Feb. 22, '07	
Christie, William.....	Prince Albert, Sask.....	Feb. 13, '76	Mar. 22, '06	S.L.S.
Clarke, Charles Wentworth.....	Regina, Sask.....	Nov. 19, '75	Mar. 21, '10	S.L.S.
Cleveland, Ernest Albert.....	Vancouver, B.C.....	May 12, '74	June 27, '99	B.C.L.S.
Coates, Preston Charles.....	Victoria, B.C.....	May 16, '81	April 19, '07	B.C.L.S.
Cokely, Leroy S.....	Duncan, B.C.....	Nov. 23, '84	Mar. 22, '10	B.C.L.S.
Cond, Fritz Thomas Piercy.....	Vancouver, B.C.....	May 16, '86	May 18, '11	B.C.L.S.
Côté, Joseph Adélard.....	Prince Albert, Sask.....	June 5, '64	May 14, '84	S.L.S.
Côté, Jean Léon.....	Edmonton, Alta.....	May 6, '67	Mar. 21, '90	A.L.S.
Cotton, Arthur Frederick.....	Massett, B.C.....	Aug. 8, '52	May 11, '80	O.L.S., B.C.L.S.
Cowper, George Constable.....	Welland, Ont.....	Oct. 20, '86	Mar. 11, '11	
Craig, John Davidson.....	Ottawa, Ont.....	Jan. 30, '76	Feb. 24, '02	Boundary Surveys, Dept. of the Interior.
Cumming, Austin Lewis.....	Edmonton, Alta.....	Aug. 25, '82	Feb. 3, '10	A.L.S.
Cummings, Alfred.....	Fernie, B.C.....	July 3, '80	Mar. 3, '09	B.C.L.S.
Cummings, John George.....	Cranbrook, B.C.....	Nov. 19, '73	Feb. 17, '04	B.C.L.S.
Dalton, John Joseph.....	Weston, Ont.....	June 12, '54	Apr. 17, '79	O.L.S., D.T.S.
Davies, Thomas Attwood.....	Edmonton, Alta.....		Feb. 22, '06	A.L.S.
Dawson, Frederick James.....	Kamloops, B.C.....	Sept. 22, '86	Sept. 12, '10	B.C.L.S.
Day, Harry Samuel.....	Edmonton, Alta.....	Nov. 14, '85	Mar. 9, '10	A.L.S.
Deans, William James.....	Brandon, Man.....	May 4, '60	May 13, '86	O.L.S.
de la Condamine, C.....	Calgary, Alta.....	Feb. 13, '75	May 4, '10	A.L.S.
Dennis, John Stoughton.....	Calgary, Alta.....	Oct. 22, '56	Nov. 19, '77	D.T.S.
Denny, Herbert C.....	Not known.....		Apr. 1, '82	
Dickson, Henry Godkin.....	Whitehorse, Y.T.....	Mar. 29, '64	Mar. 19, '89	M.L.S.
Dickson, James.....	Fenelon Falls, Ont.....	Oct. 30, '34	Apr. 14, '72	O.L.S.
Dobie, James Samuel.....	Thessalon, Ont.....	Oct. 15, '73	Mar. 22, '06	O.L.S.
Donnelly, Cecil.....	Winnipeg, Man.....	Oct. 18, '89	Mar. 15, '13	
Doupe, Jacob Lonsdale.....	Winnipeg, Man.....	Sept. 14, '67	Oct. 6, '88	M.L.S., A.L.S., S.L.S., Asst. Land Commissioner for C.P.R.
Drewry, William Stewart.....	Victoria, B.C.....	Jan. 20, '59	Nov. 14, '83	O.L.S., B.C.L.S.
Driscoll, Alfred.....	Edmonton, Alta.....	July 2, '65	Feb. 23, '87	B.C.L.S., A.L.S.
Drummond, Thomas.....	Montreal, P.Q.....		1856 June 24, '78	D.T.S.
Ducker, William A.....	Winnipeg, Man.....	April 4, '52	Mar. 30, '83	O.L.S., M.L.S.
Dumais, Paul T. Concorde.....	Hull, P.Q.....	Jan. 2, '47	Mar. 29, '82	Q.L.S.
Earle, Wallace Sinclair.....	Victoria, B.C.....	Feb. 8, '89	May 18, '11	B.C.L.S., O.L.S.
Edwards, George.....	Ponoka, Alta.....	June 13, '42	Apr. 14, '72	O.L.S., A.L.S.
Edwards, William Milton.....	Lethbridge, Alta.....	June 21, '79	Apr. 5, '10	A.L.S.
Ellacott, Charles Herbert.....	Victoria, B.C.....	Dec. 24, '66	Feb. 22, '99	B.C.L.S.
Ellis, Douglas Stewart.....	Kingston, Ont.....	Mar. 16, '85	May 17, '12	
Empey, John Morgan.....	Calgary, Alta.....	Apr. 16, '74	Feb. 23, '05	O.L.S., A.L.S.
Engler, Carl.....	Ottawa, Ont.....	Sept. 30, '72	Feb. 23, '05	T. S. Branch, Dept. of Interior.
Evans, Stanley Livingstone.....	Corinth, Ont.....	Jan. 14, '84	Feb. 13, '11	
Fairchild, Charles Courtland.....	Edmonton, Alta.....	Feb. 21, '67	Feb. 20, '01	O.L.S., A.L.S.
Farncomb, Alfred Ernest.....	Edmonton, Alta.....	May 22, '73	Mar. 12, '02	O.L.S., A.L.S.
Fawcett, Thomas.....	Ottawa, Ont.....	Oct. 28, '48	Nov. 18, '76	O.L.S., D.T.S., Boundary Surveys, Dept. of Interior.
Fawcett, Adam.....	Gravenhurst, Ont.....		Feb. 22, '93	
Ferguson, George Hendry.....	Toronto, Ont.....	Jan. 20, '83	June 2, '09	
Findlay, Allan.....	Winnipeg, Man.....	Oct. 15, '80	Mar. 21, '08	M.L.S.
Fletcher, James Allan.....	Fletcher, Ont.....	Mar. 26, '89	May 18, '11	



SESSIONAL PAPER No. 25b

APPENDIX No. 10—*Continued.*LIST of Dominion Land Surveyors who are in possession of Standard Measures—*Continued.*

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Fontaine, Louis Elie.....	Levis, P.Q.....	Oct. 3, '68	Nov. 30, '92	A.L.S., Inspector of Surveys, Dept. of Interior.
Francis, John.....	Portage la Prairie, M.	Dec. 22, '52	June 17, '75	M.L.S.
Galletly, James Simpson .....	Brooklin, Ont.....	Apr. 15, '88	May 18, '11	
Garden, James Ford.....	Vancouver, B.C.....	Feb. 19, '47	May 13, '80	B.C.L.S.
Garden, George H.....	Lethbridge, Alta.....	.....	Apr. 14, '72	Deputy Surveyor for N.B.
Garden, Charles.....	Not known.....	.....	Apr. 14, '72	Deputy Surveyor for N.B.
Garner, Albert Coleman.....	Regina, Sask.....	Sept. 6, '78	May 27, '07	S.L.S., A.L.S., Chief Surveyor Surveys Branch Land Titles Offices.
Gauvreau, Louis Pierre.....	Not known.....	.....	Apr. 14, '72	
Gibbon, James.....	Vancouver, B.C.....	June 25, '60	Feb. 12, '91	O.L.S.
Glover, Arthur Edward.....	Edmonton, Alta.....	Mar. 4, '87	Mar. 11, '11	A.L.S., S.L.S.
Gordon, Maitland Lockhart.....	Vancouver, B.C.....	Sept. 27, '82	Feb. 18, '04	B.C.L.S.
Gordon, Robert John.....	Lethbridge, Alta.....	June 18, '69	Mar. 12, '02	A.L.S.
Gore, Thomas Sinclair.....	Victoria, B.C.....	.....1852	Apr. 19, '79	B.C.L.S.
Graham, John Robertson.....	Vancouver, B.C.....	Apr. 18, '87	May 26, '10	B.C.L.S.
Grassie, Charles Andrew.....	Medicine Hat, Alta.....	Dec. 24, '83	Dec. 27, '10	A.L.S.
Gray, James Edward.....	Edmonton, Alta.....	Oct. 12, '81	Mar. 11, '11	A.L.S., S.L.S.
Green, Alfred Harold.....	Nelson, B.C.....	Jan. 20, '79	Feb. 23, '05	B.C.L.S., A.L.S.
Green, Thomas Daniel.....	Ottawa, Ont.....	Dec. 21, '57	May 19, '84	O.L.S.
Green, Frank Compton.....	Victoria, B.C.....	.....	May 8, '03	B.C.L.S.
Grover, George Alexander.....	Toronto, Ont.....	.....	Feb. 18, '04	
Haggen, Rupert Williams.....	Quesnel, B.C.....	July 29, '87	May 18, '11	B.C.L.S.
Hamilton, Charles Thomas.....	Vancouver, B.C.....	July 29, '84	May 18, '11	B.C.L.S.
Hamilton, James Frederick.....	Lethbridge, Alta.....	April 4, '69	June 2, '09	A.L.S.
Harris, John Walter.....	Winnipeg, Man.....	Feb. 26, '45	April 14, '72	O.L.S., M.L.S., Assessment Commissioner and City Surveyor.
Harrison, Edward.....	Calgary, Alta.....	.....	May 14, '10	A.L.S.
Harvey, Charles.....	Kelowna, B.C.....	May 5, '76	Feb. 17, '04	B.C.L.S.
Hawkins, Albert Howard.....	Listowel, Ont.....	July 27, '62	Mar. 6, '06	
Heaman, John Andrew.....	Winnipeg, Man.....	June 3, '75	July 15, '09	O.L.S.
Heathcott, Robert Vernon.....	Edmonton, Alta.....	July 7, '81	May 13, '07	A.L.S.
Henderson, Walter.....	Not known.....	.....	Nov. 17, '83	
Herriot, George Henry.....	Souris, Man.....	Feb. 23, '83	Sept. 18, '09	
Heuperman, Frederick Justinus.....	Calgary, Alta.....	July 23, '87	Mar. 13, '11	A.L.S.
Heuperman, Lambertus Fred.....	Calgary, Alta.....	Sept. 20, '81	Mar. 29, '10	A.L.S.
Hoar, Charles Millard.....	Calgary, Alta.....	Sept. 26, '85	Mar. 9, '11	A.L.S.
Hobbs, Wilfrid Ernest.....	Winnipeg, Man.....	Mar. 12, '97	Mar. 5, '12	M.L.S.
Holcroft, Herbert Spencer.....	Toronto, Ont.....	Sept. 4, '77	Feb. 18, '03	O.L.S.
Hopkins, Marshall Willard.....	Edmonton, Alta.....	May 24, '61	Feb. 20, '01	O.L.S., A.L.S.
Hubbell, Ernest Wilson.....	Ottawa, Ont.....	Nov. 5, '62	May 19, '84	Chief Inspector of Surveys, Dept. of Interior.
Inkster, Oluff.....	Edmonton, Alta.....	Mar. 25, '85	May 18, '11	A.L.S.
Jackson, John Edwin.....	Hamilton, Ont.....	Dec. 27, '81	May 18, '11	O.L.S.
James, Silas.....	Toronto, Ont.....	June 19, '34	April 14, '72	O.L.S.
Jephson, Richard Jermy.....	Brandon, Man.....	Feb. 5, '54	May 12, '80	O.L.S., B.C.L.S., M.L.S.
Johnson, Alfred William.....	Kamloops, B.C.....	Feb. 23, '74	Mar. 12, '02	B.C.L.S.
Johnston, James Homer.....	Edmonton, Alta.....	Aug. 23, '87	May 17, '12	A.L.S.
Keith, Homer Pasha.....	Edmonton, Alta.....	Aug. 30, '85	Feb. 1, '11	A.L.S.
Kimpe, Maurice.....	Edmonton, Alta.....	Jan. 17, '76	May 13, '07	A.L.S.
King, William Frederick.....	Dominion Observatory, Ottawa, Ont.	Feb. 19, '54	Nov. 21, '76	D.T.S. Chief Astronomer Dept. of Interior.
Kirk, John Albert.....	Sumnerland, B.C.....	Jan. 9, '54	May 11, '80	O.L.S., B.C.L.S.
Kitto, Franklin Hugo.....	Dawson, Y.T.....	Mar. 28, '80	Mar. 6, '08	
Klotz, Otto Julius.....	Dominion Observatory, Ottawa, Ont.	Mar. 31, '52	Nov. 19, '77	O.L.S., D.T.S., Astronomer, Dept. of Interior.
Knight, Richard H.....	Edmonton, Alta.....	June 7, '77	Feb. 18, '04	A.L.S.
Lamb, Frederick Carlyle.....	Saskatoon, Sask.....	Dec. 11, '88	May 17, '12	
Lang, John Leiper.....	Sault Ste. Marie, Ont.....	.....	Oct. 14, '08	O.L.S.
Latimer, Frank Herbert.....	Penticton, B.C.....	May 23, '60	Nov. 13, '85	B.C.L.S.



APPENDIX No. 10—*Continued.*LIST of Dominion Land Surveyors who are in possession of Standard Measures—*Continued.*

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Laurie, Richard C. ....	Battleford, Sask. ....	Jan. 31, '58	April 27, '83	S.L.S.
Lemoine, Charles Errol. ....	Ville Montcalm, P.Q. ....	Mar. 30, '78	Mar. 31, '82	Q.L.S.
Lighthall, Abram. ....	Vancouver, B.C. ....	Mar. 30, '78	Dec. 25, '09	S.L.S.
Lindsay, James Herbert. ....	Prince Albert, Sask. ....	Nov. 27, '82	May 18, '11	S.L.S.
Loneragan, Gerald Joseph. ....	Buckingham, P.Q. ....	Oct. 8, '71	Feb. 23, '01	Q.L.S., A.L.S., Inspector of Surveys, Dept. of Interior.
Loucks, Roy Wm. Egbert. ....	Saskatoon, Sask. ....	Oct. 31, '84	Mar. 1, '12	A.L.S., S.L.S.
Lumsden, Hugh David. ....	Ottawa, Ont. ....	Sept. 7, '44	April 14, '72	O.L.S.
MacLennan, Alexander L. ....	Toronto, Ont. ....	May 10, '88	Feb. 23, '05	S.L.S.
MacLeod, George Waters. ....	Edmonton, Alta. ....	—	Mar. 1, '12	A.L.S.
MacPherson, Charles Wilfrid. ....	Dawson, Y.T. ....	Sept. 6, '71	Mar. 7, '00	O.L.S.
Macdonald, Gordon Alexander. ....	Muirkirk, Ont. ....	May 24, '85	May 17, '12	
Magrath, Charles Alexander. ....	Ottawa, Ont. ....	April 22, '60	Nov. 16, '81	B.A.Sc., O.L.S., B.C.L.S. D.T.S., Member International Waterways Commission.
Martindale, Ernest Smith. ....	Kingsmill, Ont. ....	May 20, '86	Mar. 11, '11	
Martyn, Oscar William. ....	Regina, Sask. ....	Dec. 2, '88	Mar. 11, '11	S.L.S.
Matheson, Hugh. ....	Ottawa, Ont. ....	May 2, '79	May 9, '11	
Meadows, William Walter. ....	Maple Creek, Sask. ....	May 27, '73	Feb. 23, '05	O.L.S., S.L.S.
Melhuish, Paul. ....	Vancouver, B.C. ....	April 14, '87	May 18, '11	B.C.L.S.
Miles, Charles Falconer. ....	Toronto, Ont. ....	Jan. 30, '38	April 14, '72	O.L.S. Inspector of Surveys, Dept. of Interior.
Mitchell, Benjamin Foster. ....	Edmonton, Alta. ....	June 16, '80	April 16, '08	A.L.S.
Moberly, Harford Kenneth. ....	Moosomin, Sask. ....	—	'69 April 21, '03	S.L.S.
Molloy, John. ....	Winnipeg, Man. ....	Jan. 13, '40	April 14, '72	M.L.S.
Montgomery, Royal Harp. ....	Prince Albert, Sask. ....	May 20, '82	Feb. 23, '05	O.L.S., S.L.S.
Moore, Herbert Harrison. ....	Calgary, Alta. ....	Dec. 1, '69	Feb. 17, '04	A.L.S.
Morrier, Joseph Eldedge. ....	Prince Albert, Sask. ....	Aug. 29, '74	May 16, '07	S.L.S.
Murray, Ernest William. ....	Regina, Sask. ....	Mar. 20, '84	May 31, '10	S.L.S.
McArthur, James Joseph. ....	Ottawa, Ont. ....	May 9, '56	April 17, '79	Boundary Surveys, Dept. of Interior.
McCaw, Robert Daniel. ....	Sidney, B.C. ....	May 24, '83	Mar. 23, '09	O.L.S., B.C.L.S., A.L.S.
McColl, Gilbert Beebe. ....	Winnipeg, Man. ....	Oct. 8, '82	Mar. 20, '07	M.L.S., D.T.S.
McColl, Samuel Ebenezer. ....	Winnipeg, Man. ....	July 17, '86	May 13, '11	M.L.S.
McDiarmid, Stuart Stanley. ....	Vancouver, B.C. ....	Aug. 4, '81	Feb. 23, '05	B.C.L.S.
McElhanney, Thomas Andrew. ....	Vancouver, B.C. ....	April 21, '86	Mar. 17, '12	
McEwen, Duncan Findlay. ....	Edmonton, Alta. ....	Aug. 7, '73	May 18, '11	A.L.S.
McFadden, Moses. ....	Vancouver, B.C. ....	Aug. 26, '26	April 14, '72	O.L.S., M.L.S.
McFarlane, Walter Graham. ....	Peace River Landing Alta. ....	Sept. 28, '73	May 19, '05	A.L.S.
McFarlane, John Baird. ....	Toronto, Ont. ....	Feb. 25, '79	June 3, '08	A.L.S.
McFee, Angus. ....	Red Deer, Alta. ....	July 14, '46	April 19, '79	A.L.S.
McGeorge, William Graham. ....	Chatham, Ont. ....	Mar. 22, '87	Mar. 21, '10	O.L.S.
McGrandle, Hugh. ....	Wetaskiwin, Alta. ....	Mar. 12, '57	Mar. 30, '83	O.L.S., A.L.S.
McKay, Robert B. ....	Vancouver, B.C. ....	April 21, '83	May 21, '12	
McLean, James Keachie. ....	Ottawa, Ont. ....	Dec. 19, '51	April 1, '82	O.L.S., Dept. of Indian Affairs
McMaster, William Angus Alex ander. ....	Prince Albert, Sask. ....	Feb. 1, '85	July 6, '10	A.L.S., S.L.S.
McMillan, George. ....	Finch, Ont. ....	Dec. 9, '69	Feb. 22, '06	
McNaughton, Alexander L. ....	Cornwall, Ont. ....	Sept. 30, '81	Feb. 23, '05	O.L.S., B.C.L.S.
McPherson, Archibald John. ....	Regina, Sask. ....	—	'70 Feb. 21, '01	S.L.S.
McPhillips, George. ....	Winnipeg, Man. ....	April 26, '48	June 17, '75	O.L.S., M.L.S., A.L.S.
McPhillips, Robert Charles. ....	Winnipeg, Man. ....	April 24, '56	May 17, '80	M.L.S.
McVittie, Archibald W. ....	Victoria, B.C. ....	May 5, '58	Mar. 30, '82	B.C.L.S.
Narraway, Athos Maxwell. ....	Ottawa, Ont. ....	July 19, '88	May 18, '11	
Neelands, Rupert A. ....	Hamiota, Man. ....	Aug. 26, '84	Mar. 5, '12	
Nelles, Douglas Henry. ....	Ottawa, Ont. ....	—	Mar. 9, '07	
Neville, Everett A. ....	Ruthylen, Ont. ....	Jan. 8, '87	May 18, '11	
O'Hara, Walter Francis. ....	Ottawa, Ont. ....	—	Feb. 19, '95	O.L.S.
Ord, Lewis Redman. ....	Hamilton, Ont. ....	Oct. 17, '56	April 1, '82	O.L.S.
Palmer, Philip Ebenezer. ....	Dorchester, N.B. ....	May 6, '88	Mar. 7, '12	



## SESSIONAL PAPER No. 25b

APPENDIX No. 10—*Continued.*LIST of Dominion Land Surveyors who are in possession of Standard Measures—*Continued.*

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Parsons, Johnstone Lindsay R.	Regina, Sask. ....	Jan. 18, '76	Feb. 23, '65	O.L.S., S.L.S.
Patrick, Allan Poyntz	Calgary, Alta. ....	July 18, '49	Nov. 19, '77	B.C.L.S., D.T.S., A.L.S.
Patten, Thaddeus James	Little Current, Ont.	Feb. 4, '59	Mar. 29, '83	O.L.S.
Pearce, William	Calgary, Alta. ....	Feb. 1, '48	May 10, '80	O.L.S., B.C.L.S., A.L.S.
Pearce, Seabury Kains.	Calgary, Alta. ....	Dec. 6, '87	Mar. 9, '11	A.L.S.
Pearson, Hugh Edward	Edmonton, Alta. ....	Oct. 17, '87	May 17, '12	A.L.S.
Pequegnat, Marcel	Berlin, Ont. ....	April 27, '86	June 6, '10	O.L.S.
Peters, Frederic Hatheway	Calgary, Alta. ....	Nov. 4, '83	Mar. 4, '10	A.L.S., Com of Irrigation.
Phillips, Edward Horace	Saskatoon, Sask. ....	Dec. 19, '78	Feb. 24, '02	S.L.S.
Phillips, Harold Geoffrey	Regina, Sask. ....	Sept. 3, '87	April 23, '10	S.L.S.
Pierce, John Wesley	Ottawa, Ont. ....		Dec. 24, '09	O.L.S.
Pinder, George Zouch	Edmonton, Alta. ....	Mar. 5, '81	Mar. 15, '13	
Plunkett, Thomas Hartley	Meaford, Ont. ....	June 1, '78	Mar. 12, '68	
Ponton, Archibald William	Edmonton, Alta. ....	Jan. 25, '59	May 18, '81	O.L.S., A.L.S.
Powell, William Henry	Vancouver, B.C. ....	Dec. 22, '84	Feb. 22, '11	B.C.L.S.
Proudfoot Hume Blake	Saskatoon, Sask. ....	June 23, '58	Mar. 28, '82	O.L.S., S.L.S.
Purser, Ralph Clinton	Windsor, Ont. ....	April 7, '86	Feb. 2, '11	
Rainboth, Edward Joseph	Ottawa, Ont. ....		May 19, '81	Q.L.S., O.L.S.
Ransom, John Thomas	Toronto, Ont. ....	Aug. 24, '88	Jan. 14, '11	O.L.S.
Reilly, William Robinson	Regina, Sask. ....	Aug. 10, '57	Nov. 17, '81	O.L.S., M.L.S., S.L.S.
Richard, Joseph Francois	Ste. Anne de la Pocatière, P.Q. ....		May 13, '82	Q.L.S.
Rinfret, Claude	Montreal, P.Q. ....	Jan. 5, '86	Mar. 20, '08	Q.L.S.
Rinfret, Raoul	Montreal, P.Q. ....	July 16, '56	Feb. 20, '00	Q.L.S.
Ritchie, Joseph Frederick	Prince Rupert, B.C.	May 23, '63	Jan. 7, '89	B.C.L.S.
Roberts, Sydney Archibald	Victoria, B.C. ....	April 10, '48	May 16, '85	B.C.L.S.
Roberts, Vaughan Maurice	Goderich, Ont. ....	Mar. 22, '64	May 17, '86	
Robertson, Donald Fraser	Ottawa, Ont. ....		'80 May 25, '09	Dept. of Indian Affairs.
Robertson, Henry H.	N. Timiskaming, P.Q.	Sept. 13, '47	April 14, '72	Q.L.S.
Robinson, Ernest Walter P.	Ottawa, Ont. ....	May 8, '80	May 1, '08	
Robinson, Franklin Joseph	Regina, Sask. ....	Oct. 20, '70	Feb. 20, '00	S.L.S., Deputy Minister of Public Works.
Robinson, William Andrew	Winnipeg, Man. ....	Feb. 21, '81	Oct. 2, '11	S.L.S.
Rolfson, Orville	Walkerville, Ont.	Feb. 26, '35	July 11, '08	
Rombough, Marshall Bedwell	Morden, Man. ....	Oct. 14, '35	April 14, '72	M.L.S.
Rorke, Louis Valentine	Toronto, Ont. ....	Feb. — '65	Aug. 13, '91	O.L.S., Inspector of Surveys for Ontario.
Ross, George	Welland, Ont. ....	June 12, '53	Nov. 21, '82	O.L.S.
Ross, Joseph Edmund	Kamloops, B.C. ....	Jan. 9, '61	Feb. 12, '91	O.L.S., B.C.L.S.
Routly, Herbert Thomas	Haileybury, Ont.	Jan. 20, '78	Feb. 15, '11	O.L.S.
Roy, George Peter	Quebec, P.Q. ....	Oct. 1, '52	Nov. 17, '81	Q.L.S.
Roy, Joseph George Emile	Quebec, P.Q. ....	Mar. 14, '86	May 23, '10	Q.L.S.
Russell, Alexander Lord	Port Arthur, Ont.		April 14, '72	O.L.S.
Saint Cyr, Jean Baptiste	Montreal, P.Q. ....	Dec. 17, '66	Feb. 17, '87	Q.L.S.
Saint Cyr, Arthur	Ottawa, Ont. ....	Nov. — '60	Feb. 17, '87	
Saunders, Bryce Johnston	Edmonton, Alta. ....	Oct. 17, '60	Nov. 16, '84	O.L.S.
Scott, Walter Alexander	Calgary, Alta. ....	Aug. 8, '85	Mar. 9, '09	A.L.S., S.L.S.
Seager, Edmund	Kenora, Ont. ....	Nov. 22, '38	April 14, '72	O.L.S.
Segré, Beresford Henry	Davidson, Sask. ....	Feb. 19, '86	May 8, '12	
Seibert, Frederick V.	Rush Lake, Sask. ....	Nov. 5, '85	Mar. 11, '11	O.L.S.
Sewell, Henry DeQuincy	Toronto, Ont. ....	April 18, '48	May 16, '85	O.L.S.
Seymour, Horace Llewellyn	Red Deer, Alta. ....	June 11, '82	Feb. 22, '06	O.L.S., A.L.S., S.L.S.
Shaw, Charles Æneas	Greenwood, B.C. ....	Nov. 16, '53	May 10, '80	O.L.S., B.C.L.S.
Shepley, Joseph Drummond	N. Battleford, Sask.	Sept. 13, '79	Mar. 12, '06	S.L.S.
Smith, Charles Campbell	Vancouver, B.C. ....	Jan. 1, '73	Feb. 22, '06	O.L.S.
Smith, Donald Alpine	Regina, Sask. ....	Sept. 22, '80	April 21, '10	S.L.S.
Smith, James Herbert	Edmonton, Alta. ....	Nov. 9, '76	Feb. 23, '05	A.L.S., O.L.S.
Soars, Henry Martin Robinson	Edmonton, Alta. ....	April 22, '77	Nov. 2, '08	A.L.S.
Speight, Thomas Bailey	Toronto, Ont. ....	Feb. 8, '59	Nov. 16, '82	O.L.S.
Starkey, Samuel M.	Codys, N.B. ....	Sept. 4, '37	April 14, '72	P.L.S. for N.B.
Steele, Ira John	Ottawa, Ont. ....	April 6, '81	April 16, '08	O.L.S.



APPENDIX No. 10—*Concluded.*

LIST of Dominion Land Surveyors who are in possession of Standard Measures.—  
*Concluded.*

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Stewart, Elihu.....	Collingwood, Ont.....	Nov. 17, '44	April 14, '72	O.L.S.
Stewart, Lionel Douglas N....	Collingwood, Ont.....	.....	Jan. 27, '10	O.L.S.
Stewart, Will Malcolm.....	Saskatoon, Sask.....	Nov. 26, '84	June 6, '07	S.L.S.
Stewart, Louis Beaufort.....	Toronto, Ont.....	Jan. 27, '61	Nov. 22, '82	O.L.S., D.T.S. Professor of Surveying and Geodesy, University of Toronto.
Stewart, Alexander George,..	Edmonton, Alta..	Aug. 16, '87	Mar. 14, '10	A.L.S.
Stewart, George Alexander....	.....	.....	April 14, '72	O.L.S.
Stewart, Norman C.....	Ottawa, Ont.....	Jan. 9, '85	March 7, '12	.....
Stock, James Joseph.....	Ottawa, Ont.....	Aug. 16, '87	March 2, '10	.....
Street, Paul Bishop.....	Toronto, Ont.....	Dec. 3, '81	Mar. 29, '10	.....
Stuart, Alexander Graham....	Buckingham, P.Q.....	July 16, '88	May 9, '11	.....
Summers, Gordon Foster.....	Haileybury, Ont.....	.....	Oct. 20, '10	O.L.S.
Swanwell, Frank Cyril.....	Victoria, B.C.....	.....	May 10, '04	B.C.L.S.
Taggart, Charles Henry.....	Ottawa, Ont.....	.....	May 9, '11	.....
Talbot, Albert Charles.....	Calgary, Alta.....	April 5, '56	May 13, '80	A.L.S.
Taylor, Alexander.....	Portage la Prairie, Man	Aug. 6, '75	June 9, '04	M.L.S., S.L.S.
Taylor, William Emerson....	Owen Sound, Ont.....	Aug. 3, '81	Dec. 16, '10	O.L.S.
Teasdale, Charles Montgomery	Concord, Ont.....	Oct. 18, '79	March 9, '06	.....
Thompson, William Thomas..	Grenfell, Sask.....	Nov. 1, '53	Nov. 19, '77	D.T.S., S.L.S.
Tipper George Adrian.....	Brantford, Ont.....	July 25, '86	May 18, '11	.....
Tracy, Thomas Henry.....	Vancouver, B.C.....	June 25, '48	April 14, '72	O.L.S., B.C.L.S.
Tremblay, Alfred Joseph.....	Les Eboulements, P.Q.	.....	Feb. 18, '90	.....
Tremblay, Albert Jacques....	Edmonton, Alta.....	July 25, '87	March 1, '12	A.L.S.
Turnbull, Thomas.....	Winnipeg, Man.....	May 26, '57	Mar. 29, '82	O.L.S.
Tyrrell, James William.....	Hamilton, Ont.....	May 10, '63	Feb. 16, '87	O.L.S.
Underwood, Joseph Edwin....	Saskatoon, Sask.....	Nov. 3, '82	May 18, '11	S.L.S.
Vaughan, Josephus Wyatt....	Vancouver, B.C.....	Oct. 17, '45	June 11, '78	B.C.L.S.
Vicars, John Richard Odium..	Kamloops, B.C.....	April 16, '55	May 17, '86	O.L.S., B.C.L.S.
Vickers, Thomas Newell.....	N. Battleford, Sask....	April 19, '90	May 17, '12	.....
Von Edeskuty, Joseph Otto..	Vancouver, B.C.....	Oct. 27, '84	March 3, '13	.....
Waddell, William Henry.....	Edmonton, Alta.....	March 23, '83	Mar. 25, '07	O.L.S., A.L.S.
Waldron, John.....	Moosejaw, Sask.....	Aug. 1, '72	April 2, '07	S.L.S.
Walker, Claude Melville....	Guelph, Ont.....	Oct. 16, '84	Mar. 11, '11	.....
Wallace, James Nevin.....	Calgary, Alta.....	Aug. 21, '70	Feb. 20, '60	O.L.S., A.L.S.
Warren, James.....	Walkerton, Ont.....	Nov. 7, '37	April 14, '72	O.L.S.
Watt, George Herbert.....	Ottawa, Ont.....	Feb. 5, '76	Feb. 24, '02	.....
Waugh, Bruce Wallace.....	Ottawa, Ont.....	March 24, '88	May 28, '12	.....
Weekes, Abel Seneca.....	Edmonton, Alta.....	Feb. 17, '66	Feb. 11, '92	A.L.S., S.L.S.
Weekes, Melville Bell.....	Regina, Sask.....	Nov. 28, '74	Feb. 18, '03	O.L.S., S.L.S.
Wheeler, Arthur Oliver.....	Sidney, B.C.....	May 1, '60	Nov. 21, '82	O.L.S., B.C.L.S., M.L.S., A.L.S.
White-Fraser, George W. R. M.	Victoria, B.C.....	.....	'61 Feb. 21, '88	D.T.S., B.C.L.S.
Wiggins, Thomas Henry.....	Saskatoon, Sask.....	Aug. 24, '63	Feb. 18, '96	O.L.S., S.L.S.
Wilkins, Frederick, W. B....	Norwood, Ont.....	June 27, '54	May 18, '81	O.L.S., D.T.S.
Wilkinson, William Downing	Not known.....	.....	Feb. 22, '93	.....
Williams, Guy Lorne.....	Enderby, B.C.....	March 3, '79	June 24, '08	B.C.L.S.
Wilson, Reginald Palliser....	Winnipeg, Man.....	July 9, '72	Jan. 26, '11	M.L.S.
Woods, Joseph Edward.....	Pincher Creek, Alta....	Oct. 13, '61	Nov. 14, '85	A.L.S.
Young Walter Beatty.....	Winnipeg, Man.....	July 6, '80	Mar. 25, '05	M.L.S.
Young William Howard.....	Calgary, Alta.....	June 8, '78	May 17, '07	A.L.S. District Engineer



## REPORTS OF SURVEYORS







## GENERAL REPORTS OF SURVEYS

1912-13

## APPENDIX No. 11.

## ABSTRACT OF THE REPORT OF J. R. AKINS, D.L.S.

## BASE LINE SURVEYS IN PEACE RIVER DISTRICT.

I reached Edmonton on February 16, 1912, and having organized my party and shipped my supplies I left on the 26th for the Peace river district, the scene of my survey operations.

The route followed was by way of Grouard, Sturgeon Lake, Grande Prairie and Pouce Coupé district.

As the Canadian Northern railway was not yet completed to Athabaska Landing we went north by trail. There was very little snow, and the horses had hard work to pull the almost empty sleighs. A wagon was hired to help us as far as Athabaska Landing, where we took to the ice. From there the trail was fine and the ice in good condition so that we had good travelling as far as Pouce Coupé, where we arrived on March 23.

For the last few days the snow had been going very fast and the day following our arrival at Pouce Coupé it had almost all gone. Wagons were used for another ten miles and then we had to resort to our pack train. The spring is, without doubt, the best time for getting into this country. Work was commenced on the twentieth base line on April 3, and the west boundary of the Peace river block was reached on July 3. The country passed through was rough and hilly and consequently the work proceeded slowly, the levelling being especially difficult.

The month of June was very dry and we had considerable trouble getting observations, as there was much haze and smoke.

After completing this work we left for the twenty-third base line. Peace river was crossed at Fort St. John by swimming the horses and putting the outfit over in boats.

Work was commenced on the base line on July 27 and the sixth meridian was reached on September 4.

Very little horse feed was found along this line and on one occasion the pack train had to go fourteen miles from camp in order to get feed.

The fall of 1912 was exceedingly dry in this district, and the many fires which broke out caused much anxiety and trouble. As many as nine fires were counted around us at one time, and on one occasion we had to fight fires night and day for three days in order to save the horses and outfit. The country was burned over for more than one hundred miles north of Dunvegan.

The sixth meridian was corrected between townships 88 and 84, after which work was commenced on the twenty-second base line. After running fifteen miles of this line we came to burnt country and were forced to quit on account of not being able to secure horse feed. As there was yet no snow or ice, however, we were unable to leave for home. It was then the middle of November, and as snow might come at any time it was decided to do some outline work in the district not burnt over, while waiting.

On December 1, it began to snow and turned cold, the temperature falling to 30 degrees below zero. On the 5th we started for home, having run over one hundred and fifty miles of line during the season.

On December 6 a 'chinook' wind took away nearly all the snow. However, some ice was still left on the roads and on this the sleighs slipped fairly well, so that we were enabled to reach Grouard on the 14th. After doing a couple of days' work there,



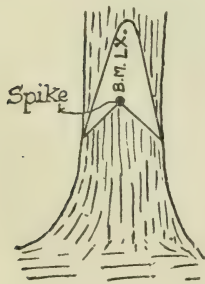
ascertaining the area of land in some fractional quarter sections, we started for Edmonton, where we arrived on December 24.

#### LEVELS.

Levels were taken along the base lines run during the season, the work being checked by a second line of levels. It was found necessary to resort to trigonometric methods for taking the levels along the twentieth base, as it was impossible to keep up the work with one level. Long sights were also taken across many of the deep valleys and ravines. Great care was used in taking these sights. The instrument was set up at one side of the valley and ten or twelve readings were taken by means of the target on the other side. The positions of the rod and level were then reversed and readings taken the opposite way. The extremes of a set of readings would be about one-tenth of a foot. The mean of each set were taken as the correct reading. The instrument was tested before and after each set was taken and the necessary correction, together with the correction for curvature and refraction, was applied. The readings to the west were taken in the morning about five o'clock, and those to the east in the evening after six o'clock. Sights of over a mile were taken in this manner and splendid results were obtained. The elevation of the bottom of the ravine or valley was obtained by running a single line of levels down one side or by reading angles with the transit.

Where the distance was too great to take sights in this manner, spirit levels were run all the way across, and where the slopes were not too steep these were checked by another line of spirit levels; where steep slopes were encountered they were checked by trigonometric levelling. The transit used for this purpose had a six-inch vertical circle graduated to 0.004 degrees (about 14 seconds). No sights were taken longer than five chains. The distance was obtained by holding one end of the chain at the axis of the transit, with the other at the centre of the target, and a strong pull was put on the chain. The two verniers were read with the telescope both direct and reversed, and the mean taken. For each slope two sets of triangles were taken as a check on each other, and remarkable results were obtained, especially when done on cloudy days, in the early morning or in the evening, and we had no trouble in checking within the limits of one-tenth of a foot to the mile. On the other lines, no difficulty was found, as the country was not rough.

Bench marks were made at intervals of about one mile. These were made on large boulders or rocks, or where these could not be found, by driving a spike into a tree and making a blaze above it with the letters 'B.M.' and the number cut on it as shown by the diagram.



Where a rock or large boulder could not be found within four miles of the last one used, a permanent bench mark was made by bending an iron post about six inches from the end, digging a hole and planting the post with about ten inches showing above the ground. The elevation recorded was the top of the iron post, and in the case of the bench marks on the trees it was the top of the spike.

#### CHAINING.

Every precaution was taken to obtain accuracy in the chaining. The chains were tested by comparison with the standard supplied by the Department, the test being made in the following manner:—



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A straight log of over a chain in length was chosen on which the standard was laid and subjected to a tension of twenty pounds, and a length of one chain was marked on the log. The chains used in chaining on the line were tested by this length giving them also a twenty-pound pull, and each one hundred links or sixty-six feet was tested separately. In practice, the chain was cleared so as to have no bends in it and a pull of about twenty pounds put on it before the distance was marked by dropping a narrow brass plumb-bob. Each half mile was checked separately, the first chainage being done with a four or five hundred link tape, the second with a three hundred foot tape. This eliminated the chance of any error of an even number of chains being made in any chainage.

Both front and rear chainmen carried clinometers with which they read the slope, and each recorded his own readings. At the end of the half mile each worked out his slopes independently. If the results obtained by each were nearly the same the mean was taken as the right slope correction for the first chainage. The same procedure was followed in the second chaining, and if the two chainages checked to within a link the post was planted at the mean of the two results thus obtained.

In the hilly country I consider two clinometers very necessary in chaining, one being used as a check on the other. Clinometers are liable to get out of adjustment sufficiently to make a considerable error in the work. Several times during the season I found it necessary to readjust the ones we were using and one was discarded altogether as it would not remain for any length of time in adjustment. If only one clinometer be used it may be considerably out without being detected unless the angle is also read with the clinometer in reversed position.



## APPENDIX No. 12.

## ABSTRACT OF THE REPORT OF C. F. AYLSWORTH, D.L.S.

## RESURVEYS IN MANITOBA.

I left home on April 23, 1912, organized my party at Winnipeg, and proceeded to township 18, range 1, east of the principal meridian, where I was to make some resurveys.

In this and the surrounding townships the soil is of good quality, but surface stones, principally limestone, are numerous, and the land is very wet. A good quality of lime can be produced from the limestone, and when the land is drained and the stones removed the soil will be first-class for farming purposes. Timothy and clover grow well, and the vegetable products of the district cannot be excelled. Last year a considerable amount of wheat was shipped from Inwood, a station on the Canadian Northern railway.

Having completed the resurvey work in township 18, range 1, on June 5, I left the following day for township 16, range 6, and did some retracement survey near the mouth of Brokenhead river. Most of the lines I retraced in this locality lie in the drowned lands and lagoons on the south shore of lake Winnipeg. The depth of water varies with the direction of the wind. When the wind blows from the north and west down the lake, the water is forced over the land to a depth depending on the velocity and duration of the wind. Brokenhead river can then be navigated for a few miles up-stream from its mouth. When the wind is in the opposite direction the flat-bottom stern-wheel boats which ply these waters are frequently compelled to "stand off" for days awaiting a sufficient depth of water to enable them to cross the shifting sandbars which lie at the mouth of the river.

A branch of the Canadian Northern railway is now under construction from Winnipeg to Balsam bay, which lies a few miles easterly from the mouth of Brokenhead river. This branch runs through country which is mostly muskeg, and in order to secure a solid road-bed the railway company dug large ditches on both sides of their right of way. These ditches drain the land through which the railway runs, and carry an immense volume of water to lake Winnipeg. Extending from the mouth of Brokenhead river easterly to Balsam Bay is a splendid bathing beach. The bottom consists of a velvety sand, and the depth of the water within ten chains of the shore, does not reach the average height of a man. This beach, with its background of balsam and spruce on the uplands, would make an ideal location for a summer resort.

I finished the work in this locality on July 3, and left for township 25, range 6, east of the principal meridian, which lies on the north end of Hecla island in lake Winnipeg. For half a mile inland on this island the land is high and dry, and was at one time heavily wooded with poplar, spruce, birch and balsam. This strip has been recently overrun by fire, and it was somewhat difficult to locate the old survey monuments. The soil is sandy loam, stony, and underlaid at a depth of one to six feet with stratified shaly limestone. Farther inland is a low tamarack and spruce muskeg which will be valueless when the timber is removed.

The settlers, all of whom live on the strip along the shore, are of Icelandic descent, and live by fishing, though farming to a very small extent is practised.

On the east side of the island, in section 27, a large gang of men are employed in a limestone quarry, which is well equipped with modern machinery, and large quantities of stone for building purposes are conveyed on barges to Winnipeg. Many



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quarry claims are staked out in sections 13 and 24, where it is intended to operate another quarry. Gull harbour on the east coast is becoming popular as a summer resort, and the establishment of a Dominion fish hatchery there renders it more important.

Wild raspberries grow on the island in great profusion, and no doubt fruits of many varieties would thrive. On an adjoining island silica sand has been discovered, and it is used extensively at the Beausejour glass factory to manufacture a very clear grade of glass.

On August 29 this work was finished, and I left by steamer for Selkirk, and thence to townships 22 and 23, range 5, west of the principal meridian. Nearly all the land in these townships is taken up. The surface is low and wet; about one-third is muskeg, and most of the remainder is poplar *brulé*, with considerable stone on the surface. The soil is very rich, but extensive drainage operations are necessary to make good farming land. A fairly large amount of green timber grows in township 23, but very little is found in township 22.

The Oak Point branch of the Canadian Northern railway crosses the southwest quarter of township 22, and some wheat was shipped from Ericksdale, a station in section 4. A passenger train service was inaugurated on this line a few days before we left the district, and the trains were loaded with passengers. This hitherto avoided portion of Manitoba appears to be coming into prominence.

As the ground was exceptionally late in freezing, I did not close operations until December 2.



## APPENDIX No. 13.

## ABSTRACT OF THE REPORT OF P. R. A. BELANGER, D.L.S.

MISCELLANEOUS SURVEYS AND INSPECTION OF SURVEY CONTRACTS IN MANITOBA  
AND EASTERN SASKATCHEWAN.

Before commencing my field operations I examined the iron posts made by the Taggart Ornamental Iron Works, of St. Boniface. On April 18, 1912, I left for the inspection of contract No. 5 of 1911, comprising township 39, range 4, and townships 39 and 40, ranges 5, 6 and 7, west of the second meridian.

Owing to slow progress, caused by the heavy rains which prevailed in May, rendering the roads impassable and making the rivers too deep to ford, this work kept us busy until May 20. These townships are accessible from Sturgis and Preeceville, by wagon roads leading from these stations along Lilian river into valley of Etomami river which runs northerly in range 5 to near the centre of township 40, where it is joined by Piwei river. From the junction of these rivers the road turns westerly along the north side of Piwei river and, meandering across the northern part of townships 40, ranges 5, 6 and 7 in the direction of Piwei lake, branches southwesterly in range 8 towards Nut Lake settlement, which is accessible by two different branches of the road after Piwei river has been crossed.

The country covered by this contract is rather bushy, except the part lying north of Piwei river, which has been considerably opened by fires, and where large tracts of land are ready for immediate settlement. A small cattle ranch owned by a Mr. White is located in the valley of Piwei river, in township 40, range 7, his cattle running all along the opening above described. He is at present at a great disadvantage on account of having to haul his hay supply a long distance over a rough road.

At the crossing of Piwei river, I entered contract No. 6, of 1911, where I inspected four townships. The country covered by this contract in ranges 8 and 9 shows a great improvement on that covered by the one just described; its character is generally rolling, open and well watered by numerous creeks, small lakes and sloughs, along and around which good hay is found in fair quantities. This country is reached by fairly good roads leading from Wadena and Tisdale railway stations through the settlements of Nut Lake, Farmingdale or Kelvington. These roads render this section very suitable for immediate settlement.

On June 10, having completed the work I had to do in Saskatchewan, I proceeded to Wadena where I shipped my outfit by rail, and boarded the train for Winnipegosis, reaching there on the 15th, after a stop-over at Dauphin for two days awaiting train connection.

From Winnipegosis, my party drove to Camperville and thence to township 35, range 21, west of the principal meridian, for the inspection of contract No. 4 of 1911, while I myself made a flying trip to Oak Point settlement for the purpose of hiring a boatman to bring my sailboat from that place to Winnipegosis. On my return to Winnipegosis I found my sail-boat had not yet arrived owing to the lack of wind to sail her up against the current of Waterhen river. I therefore despatched a small gasoline boat to bring it into the harbour, and on its arrival next day, I sailed to Camperville where I met my party which had just completed the inspection of two townships. On the following morning, after loading the camp equipage on the boat, I sailed to Duck bay. We camped at night on the bank of Insect river, in township 37, range 20. From this camp I made the inspection of that township, together with a traverse of part of Duck bay and, after another short move of camp northerly





G. H. Herriot, D.L.S.  
Loading Dog Sleighs on Moose Lake, Manitoba.



Photo. by G. H. Herriot, D.L.S.  
Rapids on Nelson River above Cross Lake.







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along the bay shore, I completed the inspection of this contract in township 38, range 20. Judging from the part examined, the country included therein is very low and wet, and practically unfit for settlement; it consists mostly of tamarack swamps or bare boggy muskegs; a few small dry elevations, where small farms could be established, are found in township 35, range 21, along the stream known as North Duck river and also in township 37, range 20. In the latter township there are numerous good hay marshes where quantities of hay can be secured, but the great drawback is the lack of proper roads, the only good way to reach the district being by the water route from Winnipegosis or Camperville. As a compensation for all these inconveniences, intending settlers would have the prospect of making money in fall and winter time with the fish and fur trade which is still remunerative.

On July 12, having completed the inspection of contract No. 4, of 1911, I returned to Camperville. My assistants and some of the party took the outfit by trail to Winnipegosis, while I, with a few men, sailed to the same place with the remainder of the baggage, reaching there on the morning of the 16th. After disposing of my boats, I left on the next day by train for Portage la Prairie, whence I drove to township 14, range 6, for the purpose of making resurveys at the south end of lake Manitoba. However, after a trial on two different lines, I found it impossible to proceed with the work as the water in the lake was two feet higher than usual, and the whole land to be surveyed was flooded to such a depth that I had no other alternative than to postpone this work until winter.

From this place I drove to Oak Point and once more put my outfit on the train to reach contract No. 2, of 1911, in township 28, range 8, where I arrived on the 24th. Here the party was busy until August 12, inspecting four townships of the contract. These townships may be described as generally level, with a few small ridges. The land is fairly good and well interspersed with hay marshes, supplying all the hay necessary for a large settlement. The northern part of township 29, range 8, is partly covered by lake St. Martin, which abounds with good fish, such as whitefish, pickerel, pike and gold-eye. All around this lake is found a large belt of fine hay land which renders this township very desirable for cattle raising on a large scale. The Canadian Northern railway crosses this contract in ranges 8 and 9, thus affording great advantage to the settlers who were already coming in at the time of the inspection.

On August 13 we boarded the train with the outfit for Pleasant Point, a station on the Canadian Northern railway in township 10, range 13, west of the principal meridian, for the purpose of resurveying part of township 8, range 12. My work there was limited to the resurvey of sections 27 to 34, inclusive, where all marks were found obliterated. I also retraced the lines and restored the monuments marking the east boundaries of sections 3, 10, 15 and 22, and connected the same with the resurvey of the east boundary of section 27. In this township all the available good land and other resources have been disposed of.

In the beginning of September, while my assistants and party were continuing the subdivision survey in the township above referred to, I went once more to Clandeboye bay where, after procuring the services of an experienced canoeman of St. Mark, I spent three days running picket lines in townships 14, ranges 5 and 6, to temporarily mark the boundaries of the Kirchhoffer Shooting Club property until a regular survey could be made on the ice. This work was carried on with success, and I believe it answered the purpose of defining the boundaries of the property for the protection of the game on account of the intended visit of His Royal Highness the Duke of Connaught to this shooting ground.

From Pleasant Point, my next move was towards Prince Albert, which place I reached by rail on September 14, but the outfit did not arrive until the night of the 16th, and could not be unloaded from the car before the next day. From there, after securing my supplies, I proceeded northerly to inspect contract No. 18, of 1912, which kept me busy until October 2. This contract covers townships 54 to 56, range 1, and



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township 56, range 2, west of the third meridian. These townships are rather heavily timbered, principally along the parts adjoining the timber berths. The country is hilly in the vicinity of Spruce river, which flows southerly across the three townships of range 1, draining townships 55 and 56, ranges 1 and 2, where the divide and height of land appears to run in a southwesterly and northeasterly direction. In township 56, range 2, the Prince Albert Lumber company have cut a short channel to divert a creek emptying into Montreal lake and bring its waters southerly into Spruce river, which empties into Saskatchewan river.

After completing this contract I undertook a seven days' journey to reach contract No. 20, of 1912, which, though only about eighteen miles west of contract No. 18, was accessible only by a circuitous route of over one hundred miles by way of Sturgeon lake, McOwan, Mount Nebo, Boutin and Big River. This contract covers townships 56 to 58, range 6, and townships 56 and 57, range 7, west of the third meridian. These townships are situated at the height of land on the north side of the divide and are mostly covered with timber, but fires have run over the country and made some openings in range 7. The land is fair, but it is badly broken by lake Delaronde and by numerous other lakes and muskgs. A few settlers have already forced their way into this country, which, on account of its close proximity to Big River village offers some opportunities for the sale of their products.

The village of Big River is situated in the southwest corner of township 56, range 7, at the south end of Cowan lake. It is now the actual terminus of a branch of the Canadian Northern railway. The Big River Lumber company owns the greater part of the village, besides large sawmills, where hundreds of men are employed all the year; so that settlers taking land near Big River will always be sure to find work at the sawmill when not working on their homesteads, and also a market for their products.

From this place, I returned to Prince Albert by rail, and then drove about fifty miles northeast to contract No. 17, of 1912, which covers townships 52 and 53, ranges 19 and 20, west of the second meridian. The road I followed to that contract passes through Henribourg settlement, and then turns east to a small Galician settlement where I struck a new road cut out a few years ago by the Hudson Bay and Pacific Railway company, and which runs across three townships of this contract. This whole road is very primitive and rough, and needs great improvement, but it is the only one by which this country can be reached.

Leaving this place, I reached the adjoining contract No. 16 by following a road cut easterly by the contractor who, I am informed, also cut another road southerly to Fort à la Corne.

Judging from what I have seen, very little land in these two contracts is fit for settlement, though the country has been much opened by fire. It is generally low and covered with numerous swamps or muskgs which were flooded by the heavy rains prevailing during last summer. The only place where homesteads could be found is along creeks, where tracts of fair land are met with, and where enough hay is found to permit of mixed farming. The draining and opening of this country might improve it to a great extent, and a dry season would also present it in quite a different aspect.

The chief aid in the development of this country will be the construction of the Hudson Bay and Pacific railway, the location line of which runs in a northeasterly direction across townships 52 and 53, range 20, and township 53, range 19.

On November 7, having completed my inspection, I returned to Prince Albert *via* Henribourg, where I delivered my transport outfit to Mr. B. Nicholson for wintering. This journey was accomplished under great hardship, through snowstorms which lasted during two days, leaving eighteen inches of snow on the ground and covering the little grass or hay that was to be found along the road.

From Prince Albert I went to Hudson Bay Junction, a station on the Canadian Northern railway, where I spent five days surveying a few lines in connection with



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timber berth No. 1920, situated in township 44, range 4, west of the second meridian. I then resumed my journey *via* Winnipeg to Cypress River, a station on the Souris-Arcola-Regina branch of the Canadian Pacific railway, for the purpose of traversing Assiniboine river across township 8, range 12, west of the principal meridian, which work had been omitted at the time of resurvey. After the completion of this survey, I returned to Winnipeg, where I discharged my party on November 30, postponing once more the survey required in townships 14, ranges 5 and 6, west of the principal meridian, owing to the fact that this marshy country was not yet frozen. I attended to this work with my assistant and a few men that I had hired on the spot, at St. Mark. I succeeded in retracing all lines, and re-established the monuments that were missing.

As this land, as well as the adjoining country, is mostly all covered with deep water or long reeds, and is owned by hunters who are anxious to protect their game against trespassers and poachers, I marked it with special iron posts, some sixteen feet and others eighteen feet in length, and generally showing about six feet above water, or a couple of feet above the reeds. The posts placed at corners in deep water are eighteen feet long and were driven from five and a half to seven feet into the ground. One post, marking the northwest angle of the reserve on lake Manitoba beach, is only six feet long, and will show three feet above the ground.

All posts on the side lines are surmounted with heavy diamond-shaped sheet iron plates with fourteen-inch sides which are painted red. They are attached by three rivets, and placed in the direction of the lines. The two posts marking the southeast and southwest angles have plates fourteen inches wide and twenty-four inches long bent in the middle at right angles to indicate the direction of the lines from the corners. Six inches below the plates are found the figures '4' or the section number indicating the corner which the post is intended to mark.

These posts are made in two pieces. The lower part is ten feet in length in the sixteen-foot posts, and twelve feet in length in the eighteen-foot posts, and is made of iron tubing one inch inside diameter. It is plugged and sharpened at the point, and threaded at the upper end. The upper part is six feet in length and is made of half-inch tubing, threaded at both ends. The two parts are fastened together by a connection which is adapted to the two sizes of tubing. A cap screwed on the top of these posts, and below the cap the plate above referred to, is attached by means of three rivets.

These posts are sufficiently noticeable to be seen by anybody and to prevent all trespassing. They should last for half a century, if properly cared for by the land-owners.

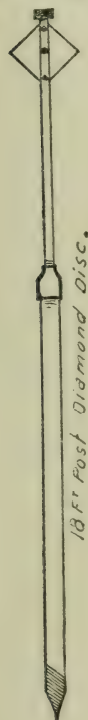
In the course of my travels in Manitoba and Saskatchewan I noticed the great movement which is going on in colonization, and which is increasing steadily year by year. The new settlers follow the trend of surveys, and were met with everywhere.

Small and large game appears to be nearly as plentiful as in the past, notwithstanding the great slaughter which occurs every year, and fish are abundant in all the waters.

No minerals were found during the course of the season's surveys.

Lumbering is still carried on on a very large scale in the Prince Albert district, where hundreds of men are employed the year round by the different companies.

Railways are extending in all directions and prove a great blessing to the settlers, as well as assisting in the development of the country.





## APPENDIX No. 14.

## ABSTRACT OF THE REPORT OF G. A. BENNETT, D.L.S.

## MISCELLANEOUS SURVEYS IN MANITOBA AND EASTERN SASKATCHEWAN.

These surveys varied greatly in character. They consisted in locating and correcting, where possible, errors in previous surveys, destroying duplicate monuments, restoring obliterated monuments and re-establishing lost monuments, traversing lakes, the boundaries of which have changed since the previous surveys, completing parts of subdivision and connecting surveys omitted by the original survey, and also investigating various errors which had been reported to the Department by settlers.

On account of the expense in travelling the long distances between the different surveys, I was accompanied on this work by only one assistant. Labourers were engaged locally when necessary and wherever possible. Most of the surveys were made in the bush country, and men were readily secured as needed, except during the harvest season, when farmers were offering labourers \$7 per day to work in the wheat fields, and every man who desired work was employed. A detailed account of the surveys made is as follows:

On May 5, 1912, I arrived at Togo, Sask., and began the season's surveys. A few miles from this growing village, a large discrepancy had been reported to exist in the original survey. By retracing, I found a considerable error in the position of one of the boundary monuments and, upon petition of all the owners of lands affected, this monument was destroyed and a new monument erected at the true corner.

This district has made great progress during the last five years. When the land was first homesteaded progress was slow on account of the country being largely covered with scrub, but to-day the bluffs have disappeared from many sections and large quantities of wheat and oats are grown for export. Having completed this survey on May 8, I travelled to McCreary by the Canadian Northern railway, but found it impracticable to make the required surveys in this district, on account of the flooded condition of the country. I therefore proceeded to Sandy lake and, with the aid of a rented canoe, was able to complete, in a couple of days, the retracement surveys required to obtain the information necessary to correct the returns of the original survey of township 18, range 20, west of the principal meridian.

During the month of May, it was very rainy in the district about the Riding mountains in northern Manitoba. Large areas of the level country at the foot of the hills were flooded to an unusual depth, making the trails impassable. On account of these conditions, I travelled around to the east side of lake Manitoba on May 15 and found that the heavy rains, which were flooding the western part of the province of Manitoba, had not extended east of the lake. The trails were in fair condition and rapid progress was made in resurveying some lands in townships 15 and 16, range 4, and retracing parts of townships 21, ranges 4 and 7, west of the principal meridian. The purpose of these surveys was to make possible the issue of correct township plans showing the present shore of lake Manitoba and the true bearings and distances of section lines not correctly returned by previous surveys. As the land in this district rises gradually from lake Manitoba, a small change in the water level of the lake greatly alters the shore line. As meadow lines of considerable value border the lake, errors in the survey are of importance. These hay meadows have been utilized by small ranchers for the last twenty years, but it is only recently that the timbered country back from the lake has been settled. The branch of the Canadian Northern railway from Winnipeg to Gypsumville has opened up this district and as the main



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roads are cut out and graded across the numerous muskegs, the homesteaders are getting better communications with the small villages springing up along the railway. Thus encouraged, the settlers are busy clearing up their homesteads, and already many fields of wheat and oats were noticed, but mixed farming is now, and will be, the staple industry here. The winter fishery on lake Manitoba is also a profitable employment for many of the settlers, while the numerous moose and elk provide food for the settlers in the newer districts.

On May 29, I completed these surveys and started for Norquay, Sask. Near this growing village I surveyed two lakes in township 34, range 1, west of the second meridian, which had been overlooked when making the original survey. This district has made rapid progress during the last few years. Graded roads extend miles from the railway, and rural telephones are found in the homes of most of the settlers. Formerly the land was covered with poplar scrub, but to-day many large fields of cultivated land are found, with numerous granaries, attesting to the productiveness of the clay loam soil.

The next survey was made in township 33, range 19, west of the principal meridian, to investigate a reported duplicate monument. I reached this work, after a two days' drive north from the town of Winnipegosis over a poor trail, which follows up to the west shore of lake Winnipegosis. Locating the duplicate monument on the flood land near the shore of lake Winnipegosis, I performed the necessary retracement, destroyed the false monument and renewed the true monument. The settlement north of the town of Winnipegosis is restricted to the lands near the shore of the lake, as the interior consists of a muskeg, which will have to be drained before the land becomes of agricultural value. However, the settlers are fairly prosperous. During the summer, they are employed in mixed farming, while the winter fishery affords them a ready market for their produce and profitable employment at the time of the year when the prairie homesteader has nothing to do.

June 22, I began a retracement survey in township 6, range 14, west of the second meridian, near the town of Weyburn, Sask., where large errors were found in the original survey. These discrepancies between the true acreage of the sections and that indicated by the titles were causing severe losses to unsuspecting buyers of land in the township. This district is undulating prairie. The land was homesteaded about fifteen years ago, and to-day the farmers have good roads, rural telephones, fine houses and outbuildings. The bountiful harvests of wheat have rendered them well-to-do within a few years.

On July 1, I visited township 31, range 31, west of the principal meridian, and made a resurvey to locate the southeast corner of this township, which is made fractional by the Côté Indian reserve. Most of the land in this district has been homesteaded by Galicians. Isolated from towns by almost impassable roads, these people live for a large part of the year on the produce of their cattle and poultry and their national black bread, and have become little Canadianized. However, the small clearings in the thick forest about their thatched log houses are being constantly increased, and soon it is hoped they shall secure schools, roads and the other advantages of civilization.

The retracement survey of part of township 21, range 14, west of the principal meridian, was next attempted. The dry weather had rendered the trails out of the village of McCreary now passable and the work was reached without much difficulty. As the original survey of this township was thirty-seven years ago, most of the monuments and marks left by that survey had disappeared and I found that all the homesteaders on the southeastern part of the township had located themselves erroneously and made their improvements upon different quarters than those which they had applied for. This is a severe set-back to the more enterprising settlers, as they lose the work of years in clearing and breaking the land, and have to move their buildings at a heavy expense.



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This district is well adapted for mixed farming. This year a large drainage canal was dredged, which will dry up the muskegs and render the trails to the township more passable, as well as protecting the farmers from the floods, which in the past have reduced their activities to stock raising and lumbering.

On July 13, I began a retracement survey of part of township 18, range 10, west of the principal meridian. Three blocks were retraced before proper closings of the survey were obtained. Many of the monuments of the original survey were lost, and some of the homesteaders were so uncertain as to their location that they hesitated to make improvements. This country had been burned over several times and the land is easily cleared of the *brulé* and scrub which is left. The soil consists of sandy loam, somewhat stony in places. The large drainage ditches dredged this year will do much to dry up the many large muskegs, which render many homesteads difficult of access at present.

A restoration survey was next made, at the request of the Director of Forestry, of the boundaries of section 6, township 20, range 20, west of the principal meridian, in the Riding Mountain Forest reserve.

On August 10, I began a correction survey of part of township 14, range 4, west of the second meridian, petitioned for by owners of lands affected by mistakes in the original survey. The land surveyed consisted of rich prairie, a large percentage of which was cultivated and gave promise of a fine yield of wheat this season. This district has been settled twenty-five years and the farmers are well-to-do and have as fine houses and bank barns as may be seen in Ontario.

The next work consisted of investigating a lake in townships 5, ranges 15 and 16, west of the second meridian, which had been reported to have partially dried up. A survey was made to correct the original plan, so as to include the lands rendered of value by the drying up of the lake.

This township has changed lately from a ranching to a farming district. The soil, consisting of a heavy white clay with much of the humus burnt off, does not seem adapted to wheat growing, so the hay meadows around the lakes and sloughs are much sought after by the settlers to assist them in mixed farming.

Completing this survey on August 16, I returned to Manitoba and left the railway at Deer Horn siding on the Gypsumville branch of the Canadian Northern railway, to proceed to township 21, range 2, west of the principal meridian. By previous arrangement, a team and a driver met me at the siding and we set out at once for the work. This was necessary, as there is little settlement here near the railway. Following the trail by Vannes and the old surveyors' trails east, I had little difficulty in getting across the muskegs with a team to reach the work. Here some hardship was experienced on account of the rainy weather, as there was no settlement in township 21, range 2, west of the principal meridian and I did not carry around with me a regular camp outfit. However, I completed the surveys required, which consisted of destroying a witness monument incorrectly placed by the original survey upon the road allowance, and ascertaining the character of another monument incorrectly returned, together with the retracement of all connecting section lines.

As there is considerable hay in this district, a few ranchers could do well here, but several deserted shacks of homesteaders to be found in township 21, range 3, west of the principal meridian, show that the floods and bad roads in spring and summer render settlement difficult at present. It is probable that when the branch line of the Canadian Northern railway is completed north from Inwood that settlers will come into this country from the east.

The next survey made consisted in laying out the boundary of Dominion lands along the Dog Creek Indian reserve and the retracing of several section lines to effect proper closings in township 22, range 8, west of the principal meridian.

On September 11, I proceeded to Ingolf, Ont., and began the work of connecting the monuments on the interprovincial boundary between Manitoba and Ontario with



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the monuments on Dominion lands in townships 9 and 10, range 17, east of the principal meridian. Very rough country composed of deep muskegs, cut by precipitous rocky hills, was encountered. As several men, whom I had expected to engage here as labourers, refused to work on surveys in this district for even \$5 per day, I was further inconvenienced, and considerable time was spent in completing this work.

When retracing the interprovincial boundary across the National Transcontinental railway-right-of-way, I noted that the railway company has erected, for the information of travellers, a signboard to mark the dividing line between Ontario and Manitoba, approximately fifty yards west of the interprovincial boundary.

The rocky country along the Ontario boundary in townships 9 and 10 is of little agricultural value. Some of the few residents of the district find land suitable for potato patches, but they live by trapping, acting as guides to summer tourists prospecting, and doing assessment work on mining claims. Several small veins of auriferous ore were noticed. The value of the mineral deposits is as yet unproven, but the numerous moose, deer, ducks and partridges found here, indicate the value of the district as a hunting ground.

A small retracement survey was made in township 6, range 9, west of the principal meridian, to effect proper closings between two old surveys. Then on October 18, I travelled to Mistatim, Sask., and completed the survey of timber berth No. 1682 in townships 45, ranges 10 and 11, west of the second meridian. No settlements other than lumber camps are found in this district.

On October 29, I began the retracement of both sides of the fifth correction line through ranges 31, 32 and 33 west of the principal meridian. Here twenty-three duplicate monuments were found and destroyed. These false monuments had caused trouble among the farmers for many years, as they did not know which were the true ones, so could not open up the road allowances.

Large discrepancies in the old surveys had caused much trouble to the settlers in developing this district, but the farmers here were found to be in a prosperous condition; although wheat farming is the principal industry, much stock is also raised.

On November 20, I travelled to Sprague, in township 1, range 14, east of the principal meridian, to make a correction survey which the settlers had petitioned for. By retracing, I found a small error in the position of one of the monuments which was therefore destroyed and a monument erected at the true corner. This district is heavily timbered and the homesteaders are making slow progress in clearing their farms. Their principal income is derived from selling firewood, raising cattle, and trapping.

The next survey consisted in correcting the posting of a small parcel of land in township 26, range 6, west of the second meridian, so that proper letters patent could be issued.

On November 26, I began retracing section lines in townships 15, ranges 25 and 26, west of the second meridian. Although several duplicate monuments had been reported, only one was found, and this was destroyed. This survey ran through some of the premier farm lands of the West. Wheat growing is to-day, as twenty years ago, the principal industry of the farmers on these celebrated Moosejaw plains. They are among the most prosperous people in the West.

The next survey consisted in retracing a large part of township 14, range 5, west of the second meridian, to determine the compensating errors in the survey arising from a deficiency of seven chains in the boundary of one section. As soon as the farmers knew that there was sufficient land in the township to give each quarter a full acreage, fifteen owners signed a petition that the survey be corrected, but three owners of land affected by the correction survey, refused to have the boundaries of their holdings altered so no resurvey was possible, under the provisions of section 57 of the Dominion Lands Surveys Act. This is to be regretted, as the township is but little developed, the



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improvements to be affected by altering the monuments being of little value, while the original survey will perpetuate very crooked roads and large inequalities in the acreage of the quarter sections in the township.

On December 13, I started from the town of Winnipegosis for Steeprock lake in township 30, range 15, west of the principal meridian. As lake Winnipegosis had now frozen over, I drove across the ice to Meadow Portage and then southeast across lake Manitoba to strike the Crane river trail, which took me just four miles south of Steeprock lake. From this trail, the lake was reached by following an old surveyor's trail. An investigation of the lake showed that large errors in the original survey necessitated a new traverse of the entire lake, which was accordingly made. No settlement was found in the vicinity of the lake, except a log cabin near a gypsum prospect on the south shore.

The next survey consisted of an investigation and survey of land around Shoal lake in township 18, range 2, west of the principal meridian. This lake is drying up very fast, and its topography has changed greatly since it was first surveyed. Large tracts of land shown under water by the original survey are now converted into valuable hay meadows, which are utilized by the neighbouring settlers. The apparent cause of the low water in this large lake is the unusually small precipitation in its drainage basin during the past four years. The lake has now no visible outlet, and its water has become so alkaline as to destroy the fish, which were very plentiful during the years of high water.

After taking some observations for azimuth in township 1, range 14, east of the principal meridian, the field work was completed on January 3, 1913, and I arrived home on the 7th.

During the course of the survey, ninety-two observations for magnetic declination were taken. These observations were obtained in forty townships, where miscellaneous surveys were being made, without materially retarding the work.





Photo by G. H. Herriot, D.L.S.  
Dog Teams on Cormorant Lake.



Photo by G. H. Herriot, D.L.S.  
Dog Teams on Cormorant Lake.







## APPENDIX No. 15.

## ABSTRACT OF THE REPORT OF E. W. BERRY, D.L.S.

## SUBDIVISION ALONG HUDSON BAY RAILWAY.

On June 16, 1912, I arrived at Winnipeg, where I spent a week outfitting and securing supplies.

I reached Pas on June 25, where I was delayed a week awaiting the arrival of freight. I then organized my party and proceeded with the survey of sections and the necessary outlines for three miles on each side of the Pas branch of the Canadian Northern railway, commencing at Pas and working southward. When the easterly portion of township 55, range 26, west of the principal meridian was completed, as it was found impossible to survey the east boundary of township 55, range 27, at this time, owing to floods, and the east boundaries of townships 53 and 54, ranges 26 and 27, until the extension of the fourteenth base line across ranges 27 and 26, the work here was discontinued and similar work commenced in townships 52 and 53, range 28, and townships 51 and 52, range 29, which occupied me until the end of October. At this date I returned to Pas, completed the subdivision of township 56, range 26, surveyed a parcel of land along Pasquia river in townships 55 and 56, range 26, and retraced the various blocks of Indian reserve No. 21 in this vicinity. The east boundary of township 55, range 27, was then completed.

The land traversed by the railway is spruce and tamarack muskeg, crossed by ridges covered with jackpine, poplar, and birch, but the timber generally is small. There is excellent gravel for road-making purposes on the ridges. The soil of the muskeg portions is a rich black loam covered with a foot of moss which prevents any run-off, and if it were removed and the land cleared, most of the land would probably be suitable for settlement without further drainage.

The only topographical feature of note is Pasquia river, the main stream of which rises in the Pasquia hills. The Turnberry branch, its principal tributary, crosses the railway in township 51, range 29, and joins the main river in a small lake about three miles north of the northeast corner of township 52, range 30. Both the main river and the Turnberry branch are fringed with poplar up to twelve inches and spruce up to twenty-four inches in diameter, suitable for pulpwood, lumber, and railway ties. The river is navigable for small steamers in summer, but is nearly dry at low water in winter. Stretches of land lie along its banks near its confluence with the Saskatchewan which produce a very fine crop of hay, but are flooded part of the season. There are good vegetable gardens on the Hudson's Bay company's property at Pas, and on some of the river lots. Grain has also been grown on these lots with satisfactory results, and the sectionmen at Westray and Turnberry sidings cultivate small gardens successfully. Strawberries and raspberries grow wild in great profusion along the railway track and dry ridges, rivalling the garden varieties in size.

Lumbering is the occupation of a large number of men in the district. The mills at Ruby lake, a few miles north of Hudson Bay Junction, and at Chemong, near the thirteenth base line, draw their raw material from adjacent limits. There is also a large saw and planing-mill at Pas, the logs being procured, for the most part, from limits up Carrot river.

During last summer the streets of Pas were cleared and graded, and sidewalks laid. The number of buildings in the town was doubled, and the lumbering industry, town improvements and railway construction promise to furnish employment for every available man for some years.



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By the courtesy of Mr. M. H. MacLeod, general manager of the Canadian Northern Railway company, I was enabled to use a push car and velocipede for transporting my supplies and equipage along the railway, which greatly facilitated the work.

On completion of the surveys in townships 55 and 56, range 26, west of the principal meridian, at the beginning of December, I secured five teams of dogs. When these were equipped and broken to harness I proceeded across Saskatchewan river, completed the subdivision of township 57, range 26, part of townships 58, ranges 26 and 25, and the whole of township 57, range 25. I returned to Pas and paid off my party on March 17, 1913.

The land in these townships is rolling country covered with jackpine, spruce, tamarack, birch and poplar, with some extensive stretches of willow swamp. In many places, especially in the vicinity of the lakes, there are quantities of timber suitable for pulpwood and milling purposes. Reader lake, an expansion of Saskatchewan river, and Watchi lake, in township 57, range 26, are shallow and marshy. Atikameg lake averages fifteen feet in depth, and the water is clear and fresh. For some years the lake has produced over forty tons of whitefish and trout annually, and shows no sign of exhaustion. The Hudson Bay railway crosses township 57, range 25, diagonally in a northeasterly direction. The bridge across the Saskatchewan is nearly completed, and steel will probably be laid across this township early next summer. A winter trail extends from Pas to Atikameg lake, and a summer trail passes through the Indian reserve. The latter is passable as far as Watchi lake, but is in bad repair the rest of the way. Atikameg lake can also be reached by water through Moose lake and Cormorant lake.

In the swamp sections the soil is a rich black loam, which would prove very fertile if drained. Much of the dry portions of these townships is covered with jackpine and shows outcrops of limestone, indicating a soil somewhat light and shallow for farming. There are, however, several sections in township 57, range 25, timbered with small poplar which should make good agricultural land.



## APPENDIX No. 16.

## ABSTRACT OF THE REPORT OF G. H. BLANCHET, D.L.S.

## SURVEY OF PART OF THE NINETEENTH BASE LINE WEST OF THE FOURTH MERIDIAN.

An early start for this survey was considered advisable, as much of the trail into the work ran through muskegs and over lakes. We started, therefore, as soon as the party could be reorganized after the completion of the twenty-third base line, leaving Athabaska Landing, March 22, 1912, and travelling by way of lac LaBiche and Heart lake. We reached our cache at Ipiatik lake in township 72, range 7, west of the fourth meridian on March 30, and on April 1 we moved by a new trail to a point three miles west of the northeast corner of section 36, township 72, range 6, the end of the previous line. The following day the line was picked up and range 6 started.

The height of land between Athabaska river and Hudson Bay drainage basins descends on its westerly slope in a series of ridges, broken by muskegs, and then drops in a well-defined escarpment, having a north and south course, to a fairly level country covered principally by muskegs and burned jackpine ridges. The base line left the rolling country of the height of land near the northeast corner of section 35, range 6.

In the first three miles of range 7, the line crossed a ridge of jackpine and poplar, extending from the northerly side of Ipiatik lake and running in a southeasterly direction.

Ipiatik lake, lying in the westerly part of range 7, is approached through a very wet tamarack muskeg. It is about two and a half miles across at its greatest width. The ridge forming the north shore of the lake swings off in a southwesterly direction along the course of Ipiatik river. The winter dog-trail to McMurray crosses the lake, running in a northeasterly direction. This route would not be feasible for a summer road, but could easily be opened up into a sleigh road.

The country north and northwest of Ipiatik lake, extending almost to the twentieth base line, is covered principally by muskegs, from which the drainage to the north flows into Christina river and to the south principally into LaBiche river and ultimately by both these channels into Athabaska river. This piece of country has probably small agricultural value, but, in conserving the water supply for the country north and south of it, it serves a useful purpose.

In range 9, several small muskeg streams unite in the vicinity of the base line to form Clyde river which, after making a detour to the north in ranges 10 and 11, crosses the base line on the westerly side of range 11, where it is about forty feet wide, five feet deep and flows through a willow bottom in a wide valley about one hundred feet deep, in which there are good hay lands. It continues in a southerly direction finally emptying into lac LaBiche.

In the middle of range 12, a large stream, which rises in the high land to the northwest, crosses the base line and joins Clyde river about seven miles south of the line. A good pack trail, running from lac LaBiche settlement to McMurray, follows along this river, striking off in a northeasterly direction about five miles north of the line.

In range 13 and most of 14 in the vicinity of the base line the country is principally muskeg, broken by brulé, jackpine and poplar ridges. To the north a rising sandy upland, covered with small second-growth jackpine extends for about ten miles, where the country rises more sharply into a poplar-covered highland. This extends west to Athabaska river. It reaches a maximum elevation in range 16, from where it becomes lower and broader as it approaches the river.



Two large streams in range 14 flowing from the north unite in the vicinity of the base line to form Wandering river. It follows along the base line to the middle of range 16 where it swings off to the north, returning and re-crossing in range 17. From there it strikes off in a southerly direction to LaBiche river. This river, with its tributaries, rising in the hills to the north and in the rolling poplar ridges to the south, affords drainage to the country between Clyde and Athabaska rivers.

The survey lines of the proposed Alberta and Great Waterways railway cross the base line in the western part of range 15, running in a northerly direction.

Between Wandering river and Athabaska river the country is principally muskeg, extending as far as the hills to the north and south nearly to LaBiche river.

Athabaska river crosses near the centre of range 18, having a general north and south course. The valley is about one mile in width and varies from 400 to 600 feet in depth. The river at that place flows at the rate of about three and a half miles an hour, and is navigable for boats of small draught for a considerable distance up stream and down stream as far as Grand rapids.

West of the Athabaska the country is high and slightly rolling, rising to the north towards the Pelican mountains, while to the south it becomes lower and forms an immense muskeg, extending to Calling river. Streams from the north are numerous. Those crossing in range 19 lose themselves in the muskeg, but those farther west unite in three principal streams, and empty into Calling lake. Some good hay sloughs and agricultural lands of excellent quality are to be found along these streams. Some patches of good spruce were found in range 19, along the course of the Athabaska.

Calling lake, which has an area of seventy-five to eighty square miles, was crossed by the line near the northerly end, most of range 22 and part of 23 being in the lake. Its length from northwest to southeast is about fifteen miles and its maximum width about seven miles. The country to the north and northeast drains through it into Calling river, which leaves it in its southeast corner and flows in a southerly direction into the Athabaska. Abundance of good whitefish are taken from this lake every winter and shipped to outside points by way of Athabaska Landing.

A well-pronounced ridge, for the most part heavily timbered with spruce, poplar, and birch up to thirty inches in diameter, extends along the southwesterly side of Calling lake, becoming high and rough in the vicinity of the base line in ranges 23 and 24.

Athabaska river, from its crossing in range 18, proceeding upstream, continues in a southerly course to Athabaska Landing, where it swings around to the north and approaches within three miles of the line in range 24, where it again swings off to the south. All this portion of the river is navigable. The country north of the river is composed of rolling poplar ridges, separated by strips of muskeg. Fawcett (formerly Moose) lake, in range 26 just north of the base line, is about eight miles long and varies from one-half to one mile wide. Fawcett river flows from its west end and empties into Lesser Slave river. There is a depression extending northeasterly from Fawcett lake which is chiefly muskeg; north of this the country rises towards the Pelican mountains.



## APPENDIX No. 17.

## ABSTRACT OF THE REPORT OF L. BRENOT, D.L.S.

## SUBDIVISION SURVEYS IN THE PEACE RIVER BLOCK.

I left Ottawa for the scene of my season's operations on February 8, 1912. A few days were spent at Edmonton in organizing my party, and on the 22nd we left for Fort St. John, B.C., travelling by Athabaska Landing, Grouard, Peace River Crossing, and thence up Peace river on the ice as far as Fort St. John.

The trip from Edmonton to Fort St. John took only thirty-five days, six of which were spent at Dunvegan waiting for my provisions which had been delayed on the journey up. Mine were the first teams to take the ice trail westerly from Dunvegan. I found the ice up to Fort St. John in good condition, and experienced no trouble whatever. I believe, moreover, that it is worthy of note, that the state of the ice will permit travelling without risk until April 5 of any year. Hay and oats had to be carried from Dunvegan, as there are neither settlers nor stopping-places between there and Fort St. John.

On April 1 the subdivision of township 84, range 19, west of the sixth meridian, was commenced, and township 84, range 18, and parts of townships 83, ranges 18 and 19, were subsequently surveyed.

Fort St. John, an old Hudson's Bay trading post, established in 1830, is situated in sections 18 and 17, township 83, range 18, on the north side of Peace river. Revillon Bros. also have an outpost at this place. The Roman Catholic Church and the Church of England have mission houses in the district, but both have been closed for the past few years.

Mail service was opened last summer between Beaverlodge and Fort St. John, proving a great boon to settlers and others in that remote part of the country. The establishment of a telegraph service between the same points is expected within a couple of years and when this is done it is intended to cut a wagon road from Pouce-Coupé prairie to Fort St. John. The road from Pouce-Coupé prairie to Beaverlodge is already opened, and has been used for the last two years.

The country surrounding Fort St. John is well drained by the Peace and North Pine rivers and the Stoddart and Montagneuse creeks. The valley of Peace river has an average width of two miles, and a depth of eight hundred feet. The river itself has an average width of twenty-five chains and a depth of not less than four feet at low water in its shallowest parts. North Pine river is a stream about four chains in width; it also runs through a valley nearly eight hundred feet deep. The hills on the northerly side of both these rivers are almost prairie land and are as good for grazing as any lands in British Columbia or Alberta. Throughout the winter these hills are wind-swept and are thus kept clear of snow. In spring, therefore, the sun takes effect on the ground long before the snow has even melted on the plains. The result of this is that vegetation springs up fully two weeks earlier than elsewhere. Ranching has been carried on successfully, as stock can range all winter with practically no loss; farming conditions are very favourable, good grain has been grown, and the gardens at Fort St. John have produced all kinds of vegetables.

After completing the subdivision in the vicinity of Fort St. John, I proceeded to Hudson Hope, following the pack trail on the north side of Peace river. About fifteen miles west of Fort St. John we passed 'Jim Rose' prairie. This is a small stretch of fertile country about four miles long by two miles wide. Two squatters here had



beautiful gardens under cultivation, and I afterwards learned that they had had great success with their vegetables, as they were unhampered by summer frosts. About twelve miles west of this place, at the meeting of Peace and Halfway rivers, another small settlement was encountered. The squatters here had been industrious, and great improvements were evident. The potatoes they had grown were the largest and finest I had ever seen.

We arrived at Hudson Hope on August 6, and proceeded next day with the subdivision of parts of townships 81, ranges 25 and 26, west of the sixth meridian, completing this work on October 11. Statutory declarations were taken from thirty-two settlers squatting in these two townships.

The Hudson Hope trading post in section 18, township 81, range 25, was previously situated on the south side of Peace river, but in 1900 it was moved to the north side, opposite its old site. A short distance northeasterly the country is suitable for ranching and farming. Furthermore, it may be reasonably believed that in the near future Hudson Hope will be one of the important towns of the North; it is the head of navigation, untold mineral wealth lies untouched in this vicinity, vast coal fields have been discovered to the west and adjoining the block, and huge water-power is within easy reach.

After completing the above-mentioned work, a large raft was built and we floated down the Peace as far as Halfway river. I here surveyed the east outlines of townships 84, ranges 22 and 23, and the south boundary of township 84, range 22, all west of the sixth meridian, with the intention of subdividing the flat adjoining this meeting of the streams. Owing to the floating ice it was impossible to complete the blocks of two sections, as prescribed in the Manual, by producing the lines across the river, so I therefore closed operations for the season on November 9. Two days later we started on the homeward journey and reached Fort St. John on the 12th. Five days were then spent repairing the outfit, shoeing horses, and bringing provisions up the hill from the Fort. The journey was then resumed and it took until November 20 to get everything across North Pine river. Then two days had to be spent baling hay which had been previously cut.

During all these preparations the 'chinook' winds had been playing havoc with the snow, not leaving enough for sleighing. I made good use of the delay thus caused by starting the subdivision of township 84, range 17, and worked until November 28. A blizzard raged all the following day, and after this we were able to move on once more.

Although heavily loaded and travelling through an unbroken country, we reached Peace River Crossing, a distance of 225 miles, in twelve days. This overland trail is almost a natural road, no work beyond opening being done, yet travelling on it is much easier than on some of the roads in daily use. In ten days we accomplished the journey from Peace River Crossing to Athabaska Landing and there we boarded the train for Edmonton, where I stored my outfit and paid off my men on December 26.



## APPENDIX No. 18.

## ABSTRACT OF THE REPORT OF M. P. BRIDGLAND, D.L.S.

## TRIANGULATION SURVEYS IN THE RAILWAY BELT OF BRITISH COLUMBIA.

Preparations for the season's survey were begun on May 3, 1912, and after making a survey of some villa lots at Banff, we left Calgary on May 9, reaching Salmon Arm in the railway belt on the 13th.

The time from May 14 till June 10 was spent on work around Salmon Arm. Two new stations were established, "Bastion" on a shoulder of the Bastion mountains five miles west of Sicamous, at an elevation of about 4,200 feet, and "Armstrong" on a burnt ridge about six miles east of Armstrong railway station, at an elevation of 5,300 feet. The latter station lies nearly a mile south of the southern limit of the railway belt at this point. In addition to the above, a third station was established on a high peak in township 18, range 13, west of the sixth meridian. Of these stations, Bastion is the only one permanently marked.

Angles were read at both ends of the Salmon Arm base and at Ida, Granite, Fly hill and Bastion. All of these stations are easily reached, and no description of the routes followed is necessary. In addition, some work was done on the Salmon Arm base. The main camp was situated near the centre of the base, and any time not otherwise utilized was spent clearing the line.

On June 11 the party moved from Salmon Arm to Malakwa, at the base of Queest mountain. A light camp was taken to timber-line just below the summit, though, owing to the large quantities of snow still remaining, considerable difficulty was experienced in finding a suitable camp ground. Then the weather changed, and for some days nothing was visible but snow, rain or fog.

On the 16th and 17th the weather cleared, the work was completed, and camp moved down to the valley. The temperature on the 17th was 103 degrees Fahrenheit in the shade, and although the descent was not difficult all members of the party were nearly exhausted on reaching the main camp.

On the 19th the main camp was moved to Revelstoke, and in the evening a light camp was brought back to Three Valley to climb Griffin mountain. In order to avoid excessive heat the climb was started that evening, and a point about 800 feet above the valley was reached. During the night a very high wind blew down a large stub which fell about two feet away from the side of the tent. This, combined with an uncomfortable bed, helped us to get an early start the next morning. At noon camp was pitched a short distance below the summit, and in the afternoon a set of angles was read. The following day smoke was so dense that further work was impossible, consequently the signal was re-erected, and the party returned to Revelstoke.

At Revelstoke Mr. McDiarmid's longitude station was located, and the angle at that point between mount Mackenzie and mount Begbie was read.

It was then decided to establish a station near the south limit of the railway belt, west of Columbia river. The party crossed the river at Wigwam, and then crossed a low divide between there and the bend of Cranberry creek. The left bank of the stream was followed till the first large stream entering from the west was reached. Camp was pitched about four miles up this stream, and the station was established on a peak about 9,000 feet above sea-level, and lying almost directly south. Angles were read, the station permanently marked and a cairn erected, although some severe thunder-storms caused a hasty retreat from the summit on more than one occasion. There is much large timber through this section, chiefly cedar



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and hemlock, but much of the country is so rough that it would be a very difficult matter to get it out.

Up to this time, plans formed during the early part of the season had been fairly well carried out, but here all work was disarranged, and remained so for the rest of the season. From June 28 till July 15 all instrument work was impossible owing to rain and clouds, and the only work done was to move camp from Revelstoke to Albert Canyon, by the Canadian Pacific railway, and thence by pack-train up the north fork of Illecillewaet river to "the farm." A light camp was pitched at timber-line below "Cornice," and on July 15 an attempt was made to read angles. Work in this valley was completed on July 18.

Mount Bonney was the next station on the list, but by the time Albert Canyon was reached, smoke was so dense that work there was considered impossible. Consequently the party returned to Revelstoke and ascended Mount Mackenzie. The distances from there to the longitude station at Revelstoke and to Mount Begbie were short, but it was only with difficulty that the signals could be seen.

After the work was completed on Mount Mackenzie, the rain began again. Consequently the party started for Mount Carnes signal near the north limit of the railway belt. This is the same mountain that has been called Mount Serenity by Mr. Howard Palmer. The route taken was the same as that followed in 1910. Angles were read at the signal, the station permanently marked, and the cairn rebuilt. A set of photographs was taken at the signal and two secondary stations were occupied. The whole trip took eight days, only three of which were fine.

The remaining stations to be reached from Revelstoke were Mount Bonney, Mount Albert and Mount Begbie. These ascents were all made by the same routes as in 1911. In each case several days were lost through bad weather, and it required twenty-two days to make the three climbs.

The party then moved to Enderby and thence to Mount Mara signal in the Hunter range. Sixteen days were spent on this trip, twelve of which were stormy. Angles were read and an azimuth observation taken.

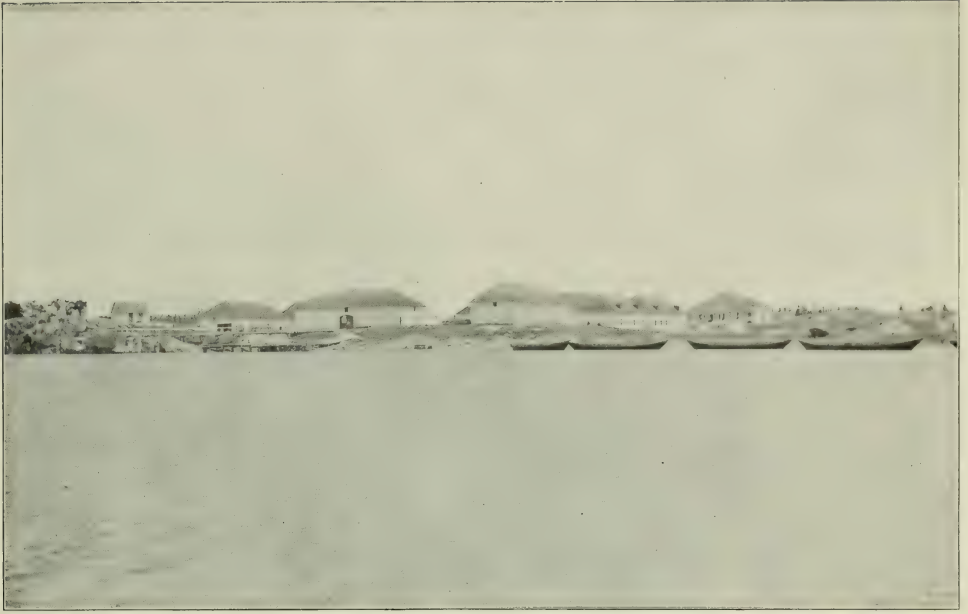
On September 11, the party started for Mabel Mountain, following the same route as in the previous year. This trip was made in five days, during which a complete set of angles was read and an azimuth observation taken. During the other four days the party travelled fifty miles by pack-train, eight miles by boat, packed camp on their backs for twelve miles, and climbed 5,500 feet.

On September 17, word was received that Mr. C. De la Condamine was waiting at Salmon Arm to commence work on the base line, and the day following the party moved over to the Arm. Angles were re-read at the ends of the base and at Mount Ida and Granite Mountain. Several attempts were made to get an azimuth at the south end of the base but, owing to clouds and excessive refraction, no satisfactory results were obtained. All triangulation work was completed on September 30.

On September 19, two men were placed at Mr. De la Condamine's disposal to assist in preparing the line. These men remained with him except for two days while assisting on Granite Mountain. The other members of the party worked on the base line while not otherwise employed. The actual measurement of the base line by the invar wire was commenced October 7 and completed November 4, during which time four measurements were made. In addition to this the base was connected with several Dominion Lands posts. A full report on the measurements of the base is being prepared by Mr. De la Condamine.

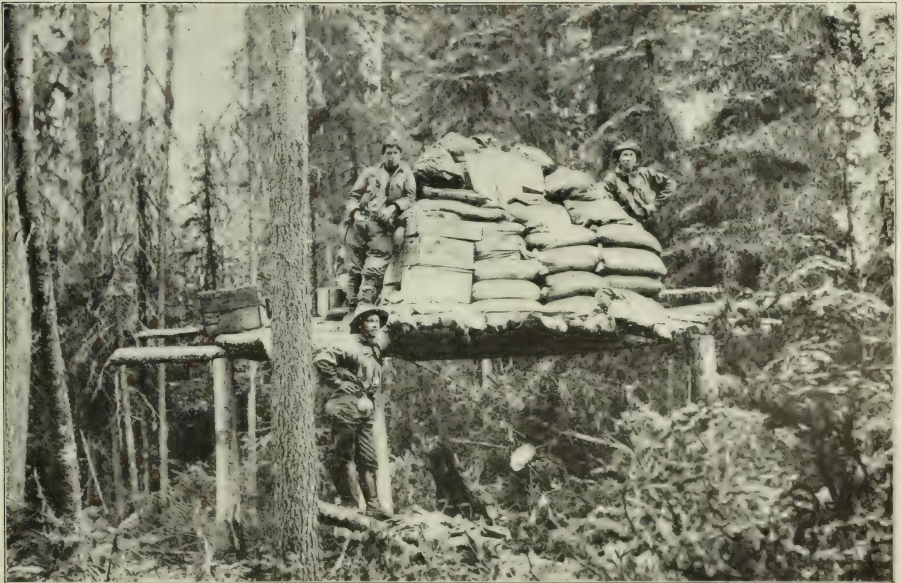
It had been intended in the early part of the season to make a rough photographic survey of the country lying between the north fork of Illecillewaet river and Columbia river, an exceptionally fine alpine country. Owing to bad weather, it was soon found that this would be impossible. However, photographs were taken whenever it was possible to do so without interfering with the triangulation work. Unfortunately, these were nearly always taken in cloudy or smoky weather.





Norway House.

Photo by O. Rolison, D.L.S.



Cache on Twenty-first base line, west of the Fourth Meridian.

Photo by F. V. Seibert, D.L.S.







## SESSIONAL PAPER No. 25b

The season of 1912 was very unfavourable for any kind of topographical work. In addition to exceptionally wet and cloudy weather, smoke caused much trouble. Immediately after heavy rains, smoke or haze was sometimes so dense that it was almost impossible to see signals. From June 17 to 25, the weather was very hot, the temperature going as high as 103 degrees Fahrenheit in the shade at Revelstoke. From June 26 to September 8, usually the most favourable season of the year, there was rain or low clouds fifty-four days, and heavy smoke seven days, a total of sixty-one days out of seventy-six, and of the remaining fifteen hardly one day was actually clear of clouds or smoke.

## MEASUREMENT OF THE SALMON ARM BASE—BY C. DE LA CONDAMINE, D.L.S.

The principle followed in the measurement was to lay down spans approximately twenty-four metres long and to then accurately measure these lengths with invar wires, the extremities of which are fitted with scales graduated in millimetres.

In order to measure a wire length or span, tripods were set over the extremities of each span, at a distance of approximately twenty-four metres; the head of each tripod bears a fine line which was placed by means of a plumb-bob over the extremity of the span. The wire was stretched between two tripods, the tension of ten kilograms being applied by two ten kilogram weights, one attached to each end of the wire by a cord which passes over a ball-bearing roller mounted on a special straining trestle. When properly placed, the graduated scales of the wire should lie against the bevelled heads of the tripods.

In December, 1910, at a temperature of fifteen degrees Centigrade, under a tension of ten kilos, the lengths of the wires were:—

No. 272.—24001.10 mm.

No. 273.—24000.94 mm.

The length at a temperature "t" is given by the formula:—

$L = 1 (1 - 0.000\ 000\ 121t + 0.000\ 000\ 000\ 15t^2)$  where L is the length at t° Centigrade, 1 is the length at 0° Centigrade.

The length of the wires increases slowly in the course of time. The operation of annealing took place on February 15, 1908, and the wires were measured on December 19, 1910.

From February 15, 1908, to December 19, 1910, there are 1,038 days and from December 19, 1910, to October 6, 1912, there are 658 days, the total being 1,696 days.

According to data obtained from a study of the material of the wire

Lengthening, for 1,038 days from date of annealing 0.0094 mm.

Lengthening for 1,696 days from date of annealing 0.0112 mm.

Lengthening from December 19, 1910, to October 6, 1912=0.0018 mm.

This refers to a wire 1 metre long. For a wire twenty-four metres long the lengthening would be  $0.0018 \times 24 = 0.043$  mm.

The length of the wire depends also on the temperature to which it has been subjected during the preceding two or three weeks. The mean temperature for two weeks previous to the measurement of Salmon Arm base, was + 11°.1 Centigrade. A special table gives for this temperature a lengthening of 0.009 mm.

On October 6, 1912, therefore, the lengths of the wires must be corrected by

$$0.043 + 0.009 = 0.052 \text{ mm.}$$

This gives:

$$\text{No. 272} = 24\ 001.152 \text{ mm.}$$

$$\text{No. 273} = 24\ 000.992 \text{ mm.}$$



These values have been taken as giving the lengths of the wires on October 6, 1912, at fifteen degrees Centigrade, and the formula of dilatation has been applied to them.

The base was marked out by Mr. M. P. Bridgland in 1910. It lies wholly in township 20, range 10, west of the sixth meridian, and is close to the town of Salmon Arm, B.C. The northeast end of the base is in section 24, the southwest end in section 5; both ends have been connected by traverses with the nearest section posts. The base has also been connected with the northeast corners of sections 10, 9, 4 and 5, also the quarter post on the east boundary of section 5, all in township 20, range 10, and the northeast corner of section 31, township 19, range 10.

Part of the line is in cleared country and part in wooded country. The ground was generally good, though a little soft in some parts, and swampy along the edge of Shuswap lake. In soft ground the tripods were set on stakes firmly driven into the ground in order to avoid any possible disturbance during the measurements.

The party consisted of two observers, a recorder, a leveller, and five labourers, two of whom were in charge of the straining trestles, two carrying the tripods and one setting them over the hubs.

As the line was at some distance from beaten trails, the work was carried on in such a way that transportation of instruments was entirely avoided, the wires only being carried back to camp every day. The base was divided into seven sections, each section consisting of a number of wire lengths. Starting at the southwest end of the base a section was measured in a northeasterly direction, the same section was then measured in a southwesterly direction and again in a northeasterly direction. The next section was measured three times in the same way, and so on to the northeast end of the base. The fourth measurement was made continuously from the northeast to the southwest end of the base.

The work was performed in the same way as in the measurement of the Kootenay base, with some little changes because of the employment of a recorder and a leveller who had not been engaged on the Kootenay base measurement. The line was picketed every twenty-four metres, using a steel tape as the steel wire supplied with the apparatus did not give good results.

The tripods being set over the hubs, and the wire placed in position, a reading was taken by each observer, this sufficing to give the distance between the measuring marks on the tripod heads. The wire was then disturbed slightly, in order to overcome any friction of the cords or rollers and another pair of readings taken. Five such pairs of readings were taken and if the five resulting distances derived from these readings agreed within  $\frac{2}{10}$  of a millimetre they were accepted. If there was a discrepancy of more than  $\frac{1}{10}$  of a millimetre between any two determinations, further readings were taken, although this was seldom necessary.

The slopes between the tripods at the different hubs were entered in a special book, the hubs being numbered to avoid confusion between the different spans. The observers changed places at mid-day each day in order to correct for personal equation.

The line is generally level, although it is broken in some places by small ridges six or seven feet high. Great pains were taken in order to obtain a slope as low as possible. In order to obtain this it was generally sufficient to set the tripods at a suitable height. In some cases, however, it was found necessary to dig trenches or to set the tripods on hubs driven into the ground. With these precautions the slope was in most cases kept below one per cent. On four or five occasions it reached five per cent, on twelve occasions six per cent, on three occasions seven per cent and once nine per cent during the four measurements. It may then be expected that the error due to inaccuracies in measuring the slope will be very small.

The slope when small was read by a special level which may be mounted on an upright gudgeon on the chaining tripods to replace a target with which each tripod



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is fitted, so that the axis of the telescope when levelled should be at the same height above the measuring mark on the tripod head as the middle line of the target. The eye-piece of the level telescope is fitted with a micrometer scale, each division of which corresponds to a slope of 1 in 1,000 at a distance of twenty-four metres.

The slope between the measuring marks on the heads of two adjacent tripods was then obtained at once by setting up the telescope on one tripod and reading off the position of the middle line of the target on the next tripod, on the micrometer scale.

The micrometer scale, having been obtained by a photographic process, is not very accurate, and it is necessary to make a small correction to each reading. In order to find the correction, two methods were employed:—

*Firstly.*—A rod graduated in centimetres was placed at twenty-four metres from the micrometer, and the division of the rod apparently in coincidence with each division of the micrometer was read. This method is not very accurate and does not give good results.

*Secondly.*—Two tripods were set at a distance of twenty-four metres. The difference of elevation of the two tripods was measured with a rod and an auxilliary level. Then the slope was measured forward and backward with the micrometer, and the mean taken. The result from the level being practically correct, this comparison gave the correction to the micrometer for the divisions used. By changing the difference of elevation of the two tripods the corrections were found for as many divisions of the micrometer as seemed necessary.

Very consistent results were obtained in this way, and showed that the micrometer could be used for slopes below four per cent. Above four per cent a special levelling was done.

The levelling was checked by the following method: At the beginning and at the end of each day's work a bench-mark was established and its elevation above or below the last tripod was measured. The readings of the micrometer giving at once the tangent of the vertical angle, by adding the tangents with their proper sign and multiplying the result by 24,000 the difference of elevations between the first and the last tripod was obtained and so the difference of elevation of the two bench-marks. When running the line again this elevation was checked and the discrepancy distributed. It was so small that it would not have appreciably affected the length of the line.

At the beginning and at the end of each day's work the first and last tripods were set over a fine mark which was left in the ground until the measurements were completed. Each tripod is fitted with a plumb-bob, the point of which is on the vertical passing through the mark of the tripod's head.

The setting of the tripods is generally very tedious, especially when there is a little wind. If the wind is too strong this method is entirely unsuitable and even when the air is quite still the error in setting cannot be expected to be less than  $\frac{1}{2}$  millimetre. For this reason the first and the last tripods were set over the marks by means of a transit. The transit being set up a few feet from the mark and at right angles with the line, the mark was sighted and the head of the tripod was moved until it came into coincidence with the cross wires, and the span was then measured; the process was repeated four times, twice circle right and twice circle left, making a new setting of the mark on the tripod head each time; the mean of the four measurements was taken. The plum-bob was used only to put the tripod on line. Generally, the mean of the first double measurement (circle right and circle left) agreed with the other within  $\frac{1}{10}$  of a millimetre. The error in setting was then negligible.

The length of the base is not an exact number of wire lengths, the last span from hub numbered 340 to A, the southwest end of base being about fifteen metres. This span was measured by triangulation and with a steel tape in the following manner: A hub numbered 341 was established beyond the end of base A and the distances 340-A and A-341 were measured with the steel tape. The span 340-341 was then measured



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with the invar wires in the usual manner, and the difference between the measurements with the steel tape and the wires was distributed in proportion to the lengths 340-A and A-341.

To obtain the length of the fractional span by triangulation, two triangles were laid down, one on each side of the base, each of them having two sides equal to twenty-four metres and the third side being the fractional span A-340. The quadrilateral thus obtained had A-340 as one of its diagonals. The eight angles and the four sides were measured and the diagonal was calculated.

The results were:—

With the steel tape . . . . .	14 923.205
By triangles . . . . .	14 923.002
Difference . . . . .	0.203
The mean . . . . .	14 923.103

This mean has been taken as it does not appear from the measurements that one method is better than the other.

The transit used was a six-inch Watts, reading to 30".

The weather was generally fair, though seven days were wet. When the rain was light some work was done, but it did not appear safe to work when the wires could not be kept reasonably dry, on account of the extra weight of the drops of water and of the stiffness of the cords passing over the straining trestles.

The range of temperature was from +1 to +24 degrees Centigrade, the largest correction for temperature for the whole length of the base was 7.084 mm., and the smallest correction 2.917 mm.

Taking into account the days or parts of days lost on account of bad weather, the four measurements lasted about seventeen days. The base being a little over eight kilometres this averaged a little less than two kilometres a day. It must be pointed out that the days were short and that it was often impossible to work after four o'clock.

The speed depended very much on the country, and, as a rule, where the country was open and flat the speed was almost twice as great as in wooded and rolling country. In all cases when measuring a base much better progress can be made as soon as the men become trained to the work.

The best speed was attained on October 22, when 110 spans or wire lengths were measured in seven hours and thirty minutes, the mean speed being about sixteen wire lengths or 389 metres per hour. The ground was rough at six of these spans which delayed the work considerably. The maximum speed reached during the whole measurement was twenty-seven spans (648 metres) per hour.

The rate at which this base was measured could not easily have been increased in flat and open country, but where the country was rough faster progress could have been made had eight tripods been available instead of six. With six tripods the method of procedure was as follows: While the front tripod was being centred the observers were taking their readings on the wire which was suspended between the next two tripods in the rear. The fourth tripod in the rear, that immediately behind the observers, was left untouched during these observations lest the observers should accidentally disturb their tripods before completing their readings. Meanwhile this tripod was sighted upon by the leveller, who had his level telescope mounted on the fifth tripod in the rear. The sixth tripod was being carried from the rear to the front, a distance of six spans, ready for centering.

When there was nothing to retard progress, the observers on finishing at one span moved on to the next, the front observer finding the tripod centered ready for him; the leveller moved up so as to leave but one unoccupied tripod between himself and the rear observer, the man engaged centering tripods moved ahead to prepare the next tripod for the front observer, and the man packing tripods made another trip. Should any one of these men be delayed, therefore, the whole party would be kept waiting,



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whereas had eight tripods been available, the observers would always have tripods ready for them, and would suffer no delays.

In rough country the leveller had to use his auxiliary level to obtain the difference of elevation of two tripods, and this necessitated two settings of the level, as all work must be checked. A vertical circle fitted on the tripod level, graduated to give sufficiently accurate readings for slopes up to ten per cent, would obviate these delays, and the leveller would then be able to keep pace with the observers in rough as well as in level country.

In order to make a comparison of the lengths of the wires in the field, one of the spans was measured eighty times with each wire. The largest measurement with wire No. 272 was smaller than the smallest measurement with wire No. 273, the two measures differing by 11.273 mm., indicating probably that wire No. 272 was longer than its accepted length, or that wire No. 273 was shorter than its accepted length.

Comparing the two means of the eighty measurements, a difference of 0.207 mm. was found between the lengths of the two wires, wire No. 272 being the longer. The difference between their accepted lengths was 0.16 mm. It would seem, then, that there was an error of 0.05 mm. in one of the accepted lengths of the wires, and from this cause the results of the measurements of the base with the two wires should differ by  $340 \times 0.05 = 17.0$  mm., wire No. 272 showing the base to be 17.0 mm. shorter than wire No. 273. The actual difference between the final results of the base measurement by the two wires is only 11.5 mm.

It must be pointed out, however, that a good comparison of the wires is impossible in the field, although from the results of the tests mentioned above, the error due to this cause would appear to be not much larger than the error of measurement.

The correction for the small difference in the intensity of the force of gravity at Salmon Arm and in France, where the tapes were standardized, was too small to appreciably affect the final results.

The mean elevation of the base above the sea-level is about 1,160 feet. Taking as radius of the earth 20,890,172 feet, the correction to reduce the base to sea-level is—453 mm.

The line was divided into seven sections. Comparing the two measurements obtained with wire 272 we have:

Section.	Spans.	Number of spans.	Discrepancy.
1.....	From 1 to 45....	45	0.526
2.....	46 55....	10	2.260
3.....	56 110....	55	1.078
4.....	111 167....	57	1.541
5.....	168 212....	45	0.161
6.....	213 290....	78	2.173
7.....	291 340....	50	0.087
		340	7.826

When measuring with wire 272 the discrepancy was always in the same direction. The probable error of one measurement due to the observing errors only,

$$= 0.477 \sqrt{\frac{340}{7} \left[ \frac{(0.526)^2}{45} + \frac{(2.260)^2}{10} + \dots \right]} \\ = \pm 2.7 \text{ mm.}$$

Probable error of the mean =  $\mp 1.9$  mm.

Probable error of one span =  $\mp 0.14$  mm.

Wire 273 gave the following results:—



Section.	Spans.		Number of spans.	Discrepancy.
1.....	From	1 to 45....	45	-0.223
2.....		46 55....	10	+0.268
3.....		56 110....	55	-1.562
4.....		111 167....	57	+0.655
5.....		168 212....	45	+2.047
6.....		213 290....	78	-0.455
7.....		291 340....	50	+2.963
			340	+3.693

Taking the probable errors of the measurements only we have

Probable error of one measurement =  $\pm$  1.9 mm.

Probable error of the mean =  $\pm$  1.4 mm.

Probable error of one span =  $\pm$  0.10 mm.

The results for each section are given in the following tables:—

Section.	Spans.	WIRE NO. 272.		WIRE NO. 273.	
		Forward.	Backward.	Forward.	Backward.
1.....	1- 45	1,080,296.754	297.280	300.109	299.886
2.....	46- 55	240,048.075	050.335	049.780	050.048
3.....	56-110	1,319,664.034	665.112	668.152	666.590
4.....	111-167	1,367,685.079	686.620	687.083	687.738
5.....	168-212	1,080,043.766	043.927	043.531	045.578
6.....	213-290	1,872,124.618	126.791	126.875	126.429
7.....	290-340	1,200,309.338	309.425	309.685	312.648
		8,160,171.664	179.490	185.215	188.908

Wire 272 (mean)..... 8,160,175.577 mm.

Fractional span..... 14,923.103

Measured length of base..... 8,175,098.680

Correction to sea-level..... 453.

Final length of base..... 8,174,645.7

Wire 273 (mean)..... 8,160,187.062 mm.

Fractional span..... 14,923.103

Measured length of base..... 8,175,110.165

Correction to sea-level..... 453.

Final length of base..... 8,174,657.2

The mean of the two lengths was accepted as the true value of the base, so that  
Accepted length of base at sea-level = 8,174.6514 metres.



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**APPENDIX No. 19.**  
**REPORT OF J. A. CALDER, D.L.S.**

SURVEYS IN THE RAILWAY BELT OF BRITISH COLUMBIA.

E. DEVILLE, Esq., LL.D.

ASHCROFT, B.C., February 12, 1913.

Surveyor General,

Ottawa, Canada.

SIR,—I have the honour to submit the following general report on my surveys in the railway belt of British Columbia, during the season of 1913.

After a few days devoted to getting my party and outfit together, I left Kamloops on June 7, and began the season's operations by making surveys required in the neighbourhood of Spence Bridge.

Lands in townships 16 and 17, ranges 24 and 25, were subdivided, and several Indian reserves and provincial lots tied in to the Dominion Lands system. Parts of the Thompson and Nicola rivers were traversed; the left bank of the former through township 16, range 25, was connected to such of the old survey monuments near the river as could be found, and these monuments were restored. Considerable difficulty was experienced in locating old corners, and many of the earlier survey monuments in the vicinity are lost.

The country in the neighbourhood of Spence Bridge appears to be particularly favourable to the production of fruit. Nearly all the varieties are grown with great success, as well as the ordinary field crops. This district, being in the "dry belt," requires irrigation, and frequently patches of good land lie unworked owing to the difficulty and prohibitive cost of getting water. Any ground in the dry belt, if not too elevated or physically unsuitable will, with water, unfailingly yield crops of all kinds in remarkable quantities and quality. In future, therefore, as land in general becomes scarcer and dearer, water will doubtless be brought to most of the lands which now lie idle for want of it.

On July 20, I moved to Canford, about twenty-eight miles up Nicola river, where I made some subdivision surveys and tied in a couple of Indian reserves.

The cultivable land in this district is well adapted for mixed farming, the elevation being about eight hundred feet higher than at Spence Bridge. I should judge that the more delicate varieties of fruit might not be a safe crop. In confirmation of this view I observed slight frosts early in August. The country generally, save for flats along Nicola river, is hilly and much of it is covered with fair timber, principally pine and fir. A saw-mill has been built on Spius creek, a couple of miles from Canford station, affording employment and a market for timber to many of the settlers.

A great deal of the best land along the Nicola valley is included in Indian reserves, and very little of it is cultivated. This is a condition general to the country, and it seems a great pity that where good land is so scarce so much of it is thus permanently idle.

Fram Canford I proceeded to Stein river to subdivide lands along its valley. This river flows from the west into the Fraser at a point about four miles above the town of Lytton. I found that for eight miles of its course the river flowed through a narrow precipitous canyon, so rough as to make it impracticable to carry on subdivision in the regular way. I accordingly located the section lines from a traverse run along the right bank of the river as far as the north boundary of section 28, township 15, range 28. Every north and south section line intersected was marked on the ground. The traverse was carefully checked by another independent traverse. From this point the canyon broadens into a valley which I subdivided for settlement as far as the centre of section 33, township 15, range 28.

In this valley, from about the east boundary of section 32, township 15, range 28, there is a narrow strip of good agricultural land as far as subdivided. This bottom land rarely exceeds a quarter of a mile in width, and is encroached upon in many places by ridges of rock debris. The sides of the valley rise abruptly in a series of



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rock slides and unscalable cliffs. The low land along the river is covered with a dense jungle of red willow and other brush, interspersed with cottonwood of fair size, and occasional groves of cedar. The difficulty of opening survey lines through such profuse vegetation seriously hindered the progress of the work. The soil is generally a light sandy loam. The valley at this point is about 1,900 feet above sea-level, and appears to be free from summer frosts, the first observed being on September 19.

Owing to the thickness of the brush, it was almost impossible to see or to hunt any large game, although it was a common experience to hear a startled bear or deer crackling through the underbrush, and their tracks were everywhere abundant.

There is no trail passable for horses up Stein river, the chief obstructions being several slides formed by huge irregular masses of rock. The only present means of access to the valley by pack train is a long circuitous trail which leaves the Fraser at a point nearly twenty miles above the mouth of Stein river, and after three days' travel, leads into Stein valley in section 33, township 15, range 29, and continues up the valley for some distance. This trail can be used only for a few months in the summer as it passes over high mountain ranges and becomes blocked by snow early in the fall. It would be a costly undertaking to build a wagon road through the canyon, but a fair pack trail can be made at a reasonable expense. A road or trail of some sort must be built before settlement in the valley is practicable. The river, however, is navigable by canoes, and a road is not so immediately essential in the valley proper.

Stein river presents excellent facilities for the development of water-power. For about nine miles it is a continuous series of rapids, the fall averaging about one hundred and fifty feet per mile. An immense volume of water is discharged, but the quantity varies a great deal according to the season.

Having exhausted my supplies, I was obliged to discontinue my surveys in the valley on October 17, arriving in Lytton on the 19th.

I next made some surveys in township 15, range 26, including the traverse of both banks of Thompson river, through the east half of the township. There is but little land of value along the river in this township, as the country generally is very rocky and broken. Upon some small spots fruit is grown successfully. There are good flats on Botanie creek at an elevation of about 1,200 feet above the Thompson. The soil is a clay loam of good quality.

On November 13 I moved to Walhachin, where I was engaged until December 14 in subdividing lands in that vicinity, suitable for settlement.

There are considerable stretches of elevated open country to the south of the town, forming excellent range land. Most of it is hilly and broken up by gulches. The soil is generally a dark clay loam of fair quality, and some of the land could be tilled profitably were water for irrigation available. The greater portion of the good farming land in the immediate neighbourhood of Walhachin is controlled by English capital, much of which has been invested in the construction of reservoirs and flumes to store and convey the water for irrigation. The greater part of their water supply is obtained from Deadman river, which flows into the Thompson a few miles east of the town. Considerable areas have been planted with fruit trees, which are as yet too young to bear. The young orchards are all thriving, and give promise of abundant returns in the near future.

I finished the season's work by tying in a small Indian reserve in township 19, range 25, and on December 20, I arrived in Kamloops, where I stored my outfit and disbanded the party.

The season was very favourable, and little time was lost on account of bad weather. The fall was unusually mild and open.

I have the honour to be, sir,

Your obedient servant,

JOHN A. CALDER, *D.L.S.*



## APPENDIX No. 26.

## ABSTRACT OF THE REPORT OF A. S. CAMPBELL, D.L.S.

## MISCELLANEOUS SURVEYS IN THE EDMONTON DISTRICT.

My first work for the season of 1912 was the resurvey of Lake St. Ann settlement.

I secured my outfit at Edmonton, where I experienced great difficulty in procuring horses owing to the great demand for them due to the large amount of railway construction work and the rapid influx of new settlers. We succeeded, however, in securing two teams, and on May 20 set out for Lake St. Ann settlement, where we arrived on the 23rd, having travelled over a road, many parts of which are about as they were in the days of Red River carts.

The resurvey of the settlement was begun immediately, but our progress was slow as the weather was very unfavourable for survey work throughout June and July, there being only four days in the latter month without rain. Almost every day we had heavy electrical storms, many of them the most violent I have ever experienced. Our progress was also hindered by the terrible condition of the roads and by the difficulty in locating the old monuments.

At Lake St. Ann is one of the very old posts of the Hudson's Bay company, and also an old established Roman Catholic mission. The annual pilgrimage to the latter is one of the chief events of the year. There are now three or four stores in the settlement, and during the past two or three years a small amount of farming has been done in the district. The coming of the main line of the Canadian Northern railway, which passes within about three-quarters of a mile of the village, will doubtless lead to a rapid advance in settlement. Much of the land in the district is of excellent quality, though still almost all covered with fairly heavy poplar and spruce, or with brulé and brush.

Lake St. Ann itself is a fine large sheet of water, affording an abundant supply of fish, chiefly whitefish and pike, many of the former being of exceptionally large size.

Most of the original owners of lots have sold their land and moved farther back and a number of the lots have been subdivided into building lots, the idea apparently being to establish Lake St. Ann as a summer resort.

The water in the lake was exceptionally high this year, a number of the original corners being now under two feet of water, and in some places the lake has advanced a hundred feet or more on the former beach. The height of the water is due partly to the very wet season, and partly to the damming up of its outlet, Sturgeon river, which, in many places is clogged with driftwood.

The land to the east of the lake is very rolling, and bears some large poplar timber, besides a considerable amount of very good hay and pasture. This should be an excellent stock-raising district.

Having completed the resurvey of the settlement on August 8 we set out for Edmonton, arriving there on the 10th. The roads were in many places almost impassable, being soft and terribly cut up by the heavy traffic due to the hauling in of railway construction supplies.

Passing through the St. Albert district we saw many excellent stock farms. The principal crops grown appeared to be oats and timothy, the railway construction causing a great demand for these commodities.



At Edmonton we spent three or four days in finding another team, after which we set out for township 53, range 21, west of the fourth meridian, where I was instructed to retrace the boundaries of sections 30 and 31. Having finished this work we left on August 24 for township 53, range 19, following the old base line road from Edmonton to Beaverhill lake district. This road has, since the operation of the Grand Trunk Pacific, fallen into disuse and is in bad condition, numerous culverts and small bridges having been burned out. The route followed took us across the Cooking Lake forest reserve. As a result of numerous fires, there is but little sign of any forest growth, especially in the southern part of the reserve.

In township 53, range 19, I found the lines very irregular and most of the corners lost altogether, as the fires had in many places burned from one to two feet into the soil. This township is very slightly settled, except in the eastern tier of sections, many of the former settlers having left when they were shut off on the west and south by the formation of the forest reserve. The land is quite flat in the eastern third of the township; the remainder is quite rolling, and contains many small lakes and sloughs, most of which, in ordinary years, produce large quantities of hay. This year, however, we found the water very high, and hay very scarce. The soil is an excellent quality of loam for the most part, except where the fires have burned down to the clay beneath, but practically the whole township would be vastly benefited by a system of drainage. This could be easily obtained through Ross creek, which empties into Beaverhill lake, and has an abundant fall in crossing the township. The settlement of this township has doubtless been much retarded by the lack of roads, the construction of which was delayed by the municipality till the position of the road allowances could be ascertained. Owing to the height of the water, I found it advisable to leave the traversing in this township till after the freeze-up.

On the completion of the mounding we left on October 28 for township 49, range 20. As there was a large amount of traversing to be done, the resurvey of this township occupied us till December 21. The township is almost all very hilly and very little of it is suitable for anything but stock raising. A few sections in the eastern and southern parts are fairly level. The soil throughout is good heavy loam. Some parts are covered with heavy poplar, but the township is largely burnt over and grown up with heavy brush.

Miquelon lake extends across the township in a southeasterly and northwesterly direction, cutting it almost in two. There are only about a dozen settlers in the township. They have done little clearing and are almost without roads, though, during the past fall, a start was made in this direction.

Miquelon lake being without an outlet is very alkaline, and contains no fish. Deer are fairly numerous, and ducks and partridges are found in thousands, both in this township and in township 53, range 19. Around Miquelon lake and the smaller lakes and sloughs in the township several thousand muskrats were caught during the past season.

The Tofield-Calgary branch of the Grand Trunk Pacific railway passes within a couple of miles of the east boundary of the township and the Camrose-Edmonton branch of the Canadian Northern railway at a slightly greater distance from the southwest corner, but as a considerable proportion of the land in the district is held at fairly high prices, settlement is slow while free homesteads can be had elsewhere. Practically all the settlers in this township are Scandinavians.

On the completion of the work in this township we returned to Edmonton, where I paid off the men on December 23.

After storing my outfit in the warehouse at Edmonton and providing for the wintering of the horses, I, with my assistant, returned to township 53, range 19, and completed the traversing in that township, arriving back in Edmonton January 2, 1913.



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## APPENDIX No. 25.

## REPORT OF A. V. CHASE, D.L.S.

## EXAMINATION OF LANDS IN KAMLOOPS DISTRICT.

ORILLIA, ONT., February 25, 1913.

E. DEVILLE, ESQ., LL.D.,  
Department of the Interior,  
Ottawa, Canada.

SIR,—I have the honour to submit the following report on the examination of lands in Kamloops district, British Columbia, during the season of 1912.

I left Orillia on May 18 and proceeded at once to Kamloops where I collected my outfit. On May 27 I sent my pack train overland, and proceeded myself by train to Ashcroft, where I assembled my party and then moved north via the Cariboo road as far as Bonaparte Indian reserve No. 3. Leaving the wagon road there I moved southwesterly by pack trail to camp near the south end of McLean lake in township 21, range 25, west of the sixth meridian, where I commenced work for the season.

Township 21, range 25, is chiefly remarkable for its great area of excellent grazing land, the value of the merchantable timber being secondary, and agricultural land being entirely absent. Nearly the whole northern part of the township is good grazing land, part of it being quite open and part of it covered with open timber and poplar groves. The eastern and southeastern part of the township is mountainous, and is covered with scattered pine and fir, some of which on the northern slopes in the northeast quarter of the township is of merchantable size and quantity. In general, the eastern part, however, is rolling, hilly land the chief value of which is for grazing purposes.

The southwestern part of the township is all timbered land, rising steeply to the southwest. The timber is fir and pine, and in some places it is of merchantable size and quantity.

On June 6 I moved camp westward from McLean lake into ranges 26 and 27 and commenced the examination of the valley of Hat creek and its branches. The work was continued south to within a short distance of the south boundary of township 19. As elevations of over 4,000 feet above sea-level were encountered there in the main valley, I decided to cease operations in that locality.

This area, comprising parts of townships 19, 20 and 21, ranges 26 and 27, appears to be an ideal stretch of country for the raising of cattle and horses. To the east and west of the main creek bottom lie excellent grazing lands to the extent of seventy-five square miles and upwards, and the main creek valley contains much excellent bottom land fit for hay growing. This bottom land is not open for settlement, being already settled and cultivated, but it is mentioned here to show the possibilities of the valley as a whole. South of the south boundary of township 21 fruit growing is not a success, but potatoes were found doing fairly well in the north part of township 19, at an elevation of about 3,700 feet above sea-level. This is an instance of how favourable local conditions may be for agricultural development, in spite of considerable altitude.

The amount of land fit for agricultural development in this valley, and still open for settlement, is extremely small. There is some land in the neighbourhood of the northeast corner of township 20, range 27, consisting of good workable soil, and at an elevation suitable for potatoes and the hardier vegetables, but an elaborate scheme



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of irrigation would be necessary to water it. Small areas of workable land are also found in the eastern parts of townships 20 and 21, in range 27, and in township 21 range 26, all of which require irrigation. For any lands lying to the west of Hat creek there is an abundance of water for irrigation purposes, the streams flowing eastward out of the Clear mountains, in range 27, having generally a good flow of water. Lands to the east of Hat creek, however, would have to be irrigated from that stream as the small supply of water from creeks flowing westward through range 26 is all being used at present.

Timbered lands comprise most of the east halves of townships 20 and 21, in range 26, and all of townships 20 and 21, in range 27, except a strip of land from one to two miles wide adjoining the east boundaries in range 27, and extending as far north as the centre of township 21, which is fairly open within the area examined. The northwest quarter of township 19, range 26, contains a couple of square miles of fairly open land, but otherwise the township is timbered throughout. No stretches of timber of such quantity and quality as to be notably valuable for lumbering purposes were noted in this valley. Bull pine and fir are most in evidence, and many areas were noted where trees 24 inches in diameter on the stump are fairly plentiful, but either the locality or the quantity is generally unfavourable to profitable lumbering operations. Speaking generally, the purpose to which the lands in Hat creek valley are best adapted is stock raising.

On June 25, I moved eastward through townships 19, in ranges 26 and 25, to a point in section 22, township 19, range 25, and proceeded to examine the lands adjacent to this camp in range 25.

The only agricultural land noticed in the west half of township 19, range 25, consists of about forty acres in the valley of Oregon Jack creek about three-quarters of a mile from the west boundary of the township. This area is good bottom land fit for hay-growing, but it is very difficult of access. The remainder of the west half of the township is steep, rocky, timbered mountains. The east portion of the township is a rolling hilly country and is more or less timbered throughout those lands still undisposed of, the timber, which is chiefly bull pine and fir, becoming open and scattered toward the east of the township. There is very little valuable land left unsettled, except a small flat area consisting of light sandy loam soil in the eastern part of the township, but this would need abundant irrigation for cultivation.

The undisposed of land in township 20, range 25, is nearly all timbered country on the slopes of the Cornwall hills. A small area, which offers fair grazing and which is partly covered with scattered bull pine, rises to the north from the valley of Cornwall creek. The small portion of township 19, range 24, lying west of Thompson river, contains two areas of good bench land fit for fruit growing, one in section 18 and one in section 31. The remainder of the lands in this township open for settlement are of value for grazing purposes only.

On July 1, I moved into Venables valley in township 18, range 25, and on the 6th into Twaal valley in the same township, examining lands from Thompson river westerly.

The Crown Grant lots and the Indian reserves in these valleys were evidently laid out with care to include all the agricultural land possible. The result is that, with the exception of a couple of small triangular areas in the angles of the lot boundaries, no agricultural land remains undisposed of, and the only valuable parts left are grazing and timber lands. The heights between the two valleys offer a considerable area of good grazing land, particularly on the slopes adjacent to Twaal creek, and a good class of scattered fir and pine is found on the upper slopes and on the lands adjoining the creek in the northern part of the township. West of Twaal creek are found two areas of fir timber of merchantable size and quantity, in all about two square miles in extent, the remainder of the hills being covered with a small and scrubby variety of timber in the northern part and old burn in the southern part. The lands adjoining Thompson river are generally open and very rough. A small flat bench of gravelly



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soil was found in the extreme northwest part of township 18, range 25, extending into township 18, range 26, but otherwise the only land of value is grazing land. The timber on the heights west of Venables valley is small and scattered. This valley is served by a good wagon road, but Twaal valley is accessible only by pack trail.

On July 10, I moved camp to Spence Bridge, and continued the examination of lands in township 17, range 25, and in the northern parts of townships 16, ranges 24 and 25.

The most of the land in township 17, range 25, consists of steep, rocky mountains, there being two summits in the western part rising to an elevation of over 5,000 feet above sea-level. The valley of Murray creek is a steep rocky gulch which widens out to an area of gently sloping land about the west boundary of the township, but this area is so difficult of access that it is of small value. Somewhat over 100 acres of good bench land was found adjoining Murray creek in sections 10, 15 and 16, at an average elevation of 2,000 feet above sea-level. This, with small acreages in sections 4, 26 and 34, makes up the agricultural land still open for settlement in this township. These lands are accessible at present by pack trail only. The areas adjoining Thompson river, both in the westerly and southerly parts, are open and semi-open lands, of use for grazing only.

Townships 16, ranges 25 and 24, west of Nicola river, are composed mainly of a range of hills the summit of which is like the Nicoamen plateau. Lands west of Thompson river in this township are all steep rocky side-hills, timbered with small and scattered fir and pine. The Nicoamen plateau proper is a rolling summit to which the land rises from Nicola river on the east and from Thompson river on the west. A number of small benches were noted on the slope adjoining Nicola river, and similarly on the slope facing Thompson river is found an area of about 200 acres of bench land, consisting of sandy loam and dark loam soils. Much of this land is at an altitude similar to that of the Rose hill district, and should prove productive under dry culture, while 75 or 100 acres of it are somewhat lower and would require irrigation. The lands in the lower levels near the rivers are fairly open, and offer good grazing areas on their north slopes. At an altitude of 2,000 feet above sea-level timber begins to be in evidence, and the summit is fairly well covered with fir and pine of medium size.

On July 17, I moved camp from Spence Bridge westerly through townships 16 in ranges 25 and 26, and camped at the south end of Botanie lake in township 16, range 26, from which point I examined lands to the south and north in townships 16 and 17.

The chief resource of township 17, range 26, is a large area of excellent grazing land. Botanie Indian reserve No. 15 was evidently laid out with the intention of including all the valuable land in the main valley, but there is still some good grazing land east of the reserve, particularly in the south centre of the township. The land in the north centre and the northeast part is extremely rough and in general timbered. It was not examined in detail. The northwest part immediately north of the reserve is also very rough, except for a small jackpine flat of no agricultural value.

Coming southward into township 16, range 26, little land of value is found, nearly three-quarters of the area of the township being composed of rocky mountains. The valley of Botanie creek, running from north to south through the western part of the township, is very narrow and steep, and only near the south boundary is any land found fit for agricultural purposes, and this does not exceed 100 acres. This land is found to be very sandy, and the adjoining land under cultivation requires an abundance of water for irrigation. Very little valuable land is found on the hills to the east and west of the valley. A strip of timbered land about one-quarter of a mile wide follows the creek bottom, and contains a quantity of pine, fir, hemlock and spruce fit for ties.

The importance of Botanie lake as a reservoir for irrigation purposes should be noticed here. In the spring of the year a great flow of water goes to waste through Botanie creek to the south, and Skoonka creek to the east, leaving the normal flow



of the summer season much below what could be utilized for lands in Botanie creek valley and along Fraser river in township 15, range 27. By means of a dam at the south end of Botanie lake and a creek diversion to bring the waters at present draining east through Skoonka creek into the lake, a supply could be obtained sufficient to irrigate all the agricultural land in these areas.

On July 23, I moved camp south into township 15, range 26, and continued examination of the lands in that township north of Thompson river and in township 15, range 27, east of Fraser river.

A great part of township 15, range 26, is composed of the rough rocky hills of the Scarped mountains. The valley of Botanie creek, in which lies practically all of the agricultural land north of Thompson river, is fairly well settled and very little of this land remains undisposed of. Small areas of dry sandy loam bench land are found north of the Thompson in sections 8, 17, 18 and 19 which, with abundant irrigation, would be suitable for fruit-growing. The timber in this valley is unimportant.

I next moved camp to a point in Spintlum Flat Indian reserve No. 3 in township 16, range 27, and on July 31 to a point in section 30, township 17, range 27, from which main camp I completed the examination of lands east of the Fraser as far north as the boundary of the railway belt.

Only a few scattered areas of bench land fit for agricultural purposes were found east of the Fraser in townships 15 to 18, inclusive. In township 15 range 27, all the workable land east of the river sufficiently flat for cultivation is contained in sections 24 and 25. About 150 acres are workable, but this land would require abundant irrigation as the soil is sandy and porous. The remainder of the undisposed-of land in this locality is composed of gravelly cutbanks rising steeply to rocky hills. In township 16, range 26, east of the river, the hills come down to the water's edge in the southern part but recede as one goes north to about one-half mile from the river's edge, leaving a small flat in the northeast quarter of section 4, and small benches in the west half of section 16, the northwest of section 21, and the southeast quarter of section 32. None of these areas is in itself of sufficient size to provide sustenance for a settler, and they are all of small agricultural value without irrigation.

In township 17, range 27, east of the river, the hills rise steeply from points one-half to three-quarters of a mile from the river's edge, leaving small areas of bench land in sections 5 and 8, also about five acres in section 20, a considerable area adjoining but not included in lot 82 in sections 19 and 30, and a small area in section 31. These areas are all at an elevation suitable for fruit-growing, but require irrigation for successful cultivation. In the upper valley of Luluwissin creek there is considerable land in sections 22 and 23 suitable for hay-growing, but oats tried in this locality were not successful on account of the elevation, which is 3,500 feet above sea-level. A valley extends southward through section 15 containing an area of gently-sloping land fit for hay-growing. Having a southern exposure it is probable that this land would require irrigation in spite of its elevation, which is also in the neighbourhood of 3,500 feet above sea-level. In township 18, range 27, the only land of agricultural value found was in the southwest quarter of the township, and consisted of a small area adjoining lot 83 to the east in section 6, and about fifty acres some two miles up the creek valley in section 5. The remainder of the township is rough timbered hills.

In township 18, range 28, east of the Fraser, lie a number of small areas of dry sandy loam bench land suitable for fruit, if irrigated. Sections 1, 12, 13, 14, 22 and 23 contain small areas of this nature, none of which is sufficient alone for one holding and all of which need abundant irrigation. A fine area of bench land is found in section 26 at an elevation suitable for mixed farming, though a trifle too high for fruit-growing. These bench lands could be irrigated from Cinquefoil creek and a dam at its south end would turn Cinquefoil lake into an ample reservoir for the irrigation waters.



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The hills to the east of the main valley of the Fraser are rough throughout and the timber on them is of little value. They are covered mostly with a small scrub variety of pine and fir, the only areas of timber having any value being in the eastern part of township 17, range 27, and in the northern part of township 18, range 28, where a very fair class of bull pine and fir was found. On August 12, I crossed Fraser river by ferry and established the main camp in section 7, township 17, range 27, from which point I proceeded to examine the lands to the west of the river from the boundary of the railway belt southward. On the 21st, I moved camp southward to section 22, township 15, range 27, and continued examination of lands to the west of the river as far south as township 14.

The lands west of the Fraser, bordering as they do on the mountains of the coast range, presented the roughest area encountered up to that time in the season's work. All the land of agricultural value found, lies within a mile of the river, the high mountains rising in some instances right from the water's edge. Fractional township 18, range 28, contains about 200 acres of excellent fruit land in sections 11, 14 and 15. This land borders on the Fraser and has a creek flowing through it which should provide abundance of water for irrigation purposes. Several old buildings are seen, and the land has every appearance of having been cultivated at one time. It is nearly all cleared and the loam soil, though slightly sandy, should prove very fertile under proper treatment. The remainder of the unsettled part of this township, west of the river, is steep rocky mountains covered mostly with timber, which is of small value on account of its inaccessible position.

Coming south into townships 17, in ranges 27 and 28, I found a number of small but fertile benches of excellent loam and sandy loam soil, generally suitable for fruit-growing, but in one or two instances more suitable for hay. These lands, with the exception of certain areas which lie as far as two miles westward, in the valleys of Intlpam and Siwhe creeks, are all situated within one mile of the river. The most southerly of these lands in this township is situated immediately west of the Fraser, partly in township 17 and partly in township 16. An area of about twenty acres of this land, although still undisposed of, is cultivated and, at the time of examination, was producing an excellent crop of beans.

Two factors may enter into the reason why these excellent lands, with abundance of water for irrigation purposes nearby, should not have been settled before now. Firstly, they are only accessible by pack trail from Lillooet, or by wagon road and ferry from Lytton. As there is only one ferry between Lytton and Lillooet, and it is privately owned, this feature places the lands in an undesirable position. Secondly, a number of these benches are at present occupied and cultivated by Indians, as for instance the bench at the south boundary of township 17, and the process of ejection is not attractive to the ordinary settler, possession being nine points of the law in the eyes of the red men.

Continuing southward through township 16, the country to the west of the river is essentially mountainous and, with the exception of those lands already laid out in Indian reserves, only two areas of agricultural land were discovered. One, already mentioned, at the north boundary of the township consists of about fifteen acres of bottom land at an elevation of 1050 feet above sea-level, in the southwest quarter of section 20. This last is at present under cultivation and is occupied by Indians.

The lands in township 15, range 27, west of the Fraser, follow the general character of lands in that locality. A strip of rolling bench land from one-half to one mile in width is found along the river between the water's edge and the mountains proper. West of this strip the mountains rise in rock formation towards summits of, in some instances, 8,000 and 9,000 feet above sea-level. Sections 28 and 33 hold a large area of workable bench land of sandy loam soil suitable for fruit-growing. About one hundred and sixty acres of workable land is contained in this area, fifty acres of which is cultivated and is producing hay. This land is evidently occupied by Indians.



Agricultural land is also found in considerable areas in the southern parts of sections 22 and 23, and the northern parts of sections 14 and 15. Some of this also is under cultivation in hay and is occupied by settlers. Other agricultural areas, about seventy-five acres in extent, were found around the northeast corner of section 2; some of these are also under cultivation in hay. The southwest quarter of section 1 contains a number of small areas of bench and bottom land of from two to five acres each, which are mostly under cultivation in hay or fruit and are evidently utilized by Indians. The land undisposed of in this township is nearly all timbered, but no areas of timber particularly valuable for lumbering purposes were noted. Bull pine and fir are scattered throughout, and show the greatest value in the south part of section 1, and in certain areas on the south side of Stein creek in the centre and west part of the township. Practically no grazing lands lie in this township.

On August 28, I returned to my old camp in township 17, range 27, west of the Fraser, to complete the examination of certain lands overlooked before on the assumption that they had been disposed of as Indian reserves. It was my intention here to move into the country surrounding the upper waters of Stein creek to make an examination of the lands there, upon which considerable comment, favourable and otherwise, was heard in the neighbourhood of Lytton. To this end I moved my outfit to Fish lake in the west part of township 17, range 28, with the intention of reaching the upper waters of Stein creek by way of a trail used by Mr. A. W. Johnson, D.L.S., about four years previously, in taking in survey supplies. At this point a continued heavy snowfall was encountered, completely obliterating the old trail which was, at best, difficult to follow. Snow continued to fall and the Indian who was to guide us over the passes failed to put in an appearance, so I decided to waste no more time in this attempt and moved my camp back to the Fraser, crossed to the east side by ferry and moved to a point in section 8, township 15, range 26, where, on September 9, I continued examination of lands eastward along the main valley, and to the south of, Thompson river.

Township 15, range 26, south of the river is a very rough area, consisting of steep mountain slopes rising from near the water's edge southward toward the summit of the Lytton mountains. A few small areas of stony bench land remain undisposed of in this locality, but they are of small importance on account of the difficulties in the way of irrigation. The chief characteristic of much of this area is its steepness and inaccessibility. It is timbered with a fair quality of pine and fir. The lands in the east part of township 15, range 26, north of the Thompson are chiefly rock hills, sparsely timbered with small and medium-sized pine.

On September 12, I moved camp to a point on Nicoamen river in township 15, range 25, and continued the examination of lands in the main valley of the Thompson, and eastward through that township. No agricultural land was found in this vicinity west of the river, the surface being steep rocky side-hill, sparsely timbered with small pine and fir. Areas south of Thompson and Nicoamen rivers show no agricultural land of importance, the whole being timbered hilly country, with some scattered areas of good pine and fir. Sections 16, 20, 21 and 22 contain areas of bench land aggregating about one hundred and twenty acres. The areas in sections 16, 20 and 21, to the extent of twenty acres, are dry sandy loam land, very suitable for fruit-growing, but they would need abundant irrigation. The lands in section 22, to the extent of about one hundred acres, lie at an elevation of 2,800 feet and upwards, and have possibilities of fertility under dry culture. They are gently rolling, of sandy loam soil, slightly stony in places, and are timbered throughout with a fair quality of pine and fir. This area is at too great an elevation to be irrigated from Nicoamen river; the lands in sections 16, 20 and 21, however, could be irrigated from it, but at considerable expense.

Considerable land in the northeastern part of the township on the Nicoamen plateau is gently rolling semi-open land with good sandy loam soil, but it is unlikely





Photo by E. Deville, D.T.S.  
Looking down the Athabaska, Jasper Park. Maligne Mountains in the distance.



Photo by E. Deville, D.T.S.  
Lake Patricia, Jasper Park.







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that these areas have any great agricultural value on account of their inaccessibility, though their altitude, which reaches 3,500 feet above sea-level in places, may not be too great for dry culture. No areas were found under dry culture at any altitude in this locality, so no report as to its possibilities could be obtained. The remainder of the land in township 15, range 25, is rough and valueless except for grazing purposes and for scattered areas of timber of merchantable size.

On September 19, I moved camp to a point near the north boundary of township 15, range 24, about three-quarters of a mile west of Nicola river, and proceeded with the examination of the lands adjacent thereto. On September 24, I moved camp to a point in section 4, township 15, range 23, and on the 28th to a point west of Spius creek in section 35, township 13, range 23, continuing examination of lands southward up the creek valley.

A few small benches of sandy loam soil were noted adjoining Nicola river in township 16, range 24, of an aggregate area not exceeding seventy-five acres. Other small areas about one mile west of the river in the southern part of the township were noted, as well as an area of about twenty acres in extent along the south boundary of section 5, which has been fenced and cultivated. These are the only areas of agricultural land found in townships 15 and 16, west of Nicola river in range 24. Township 16, range 24, contains a large area of good grazing land west of the river, but little timber of value is seen except in the southwestern part. Continuing southward along the valley of the Nicola, the lands to the west are chiefly rough timbered hills as far south as the south boundary of township 14. In township 15, range 23, there is an aggregate area of about seventy-five acres of agricultural land undisposed of, lying in sections 8, 9 and 16, about forty acres of which is at an elevation suitable for dry culture, and the remainder of which would need irrigation. Some good areas of timber are found in townships 14 and 15, particularly along a creek valley in the west part of township 14, where a quantity of excellent bull pine and fir up to thirty inches in diameter is found. It is, however, in an almost inaccessible locality, and has small monetary value on that account.

The agricultural lands of township 13, range 23, were found to be fairly well settled, and little land of this nature remains unoccupied. Areas of good sandy loam soil suitable for cultivation, and totalling about one hundred and twenty acres, were found in sections 23, 27, 33, 34 and 36, but only one of these patches seems to be of sufficient area for a single holding. This area, containing about fifty acres of jack-pine flat in section 33, is at an elevation of 3,100 feet above sea-level, and should be suitable for dry culture. The chief asset of the lands undisposed of in township 13, range 23, is the timber, much of which is excellent pine and fir up to thirty inches in diameter.

On October 7, I moved camp to a point in township 12, range 23, near the junction of Spius and Prospect creeks, and on the 15th to a point on Spius creek in the north part of township 11, range 23, and proceeded with the examination of lands in those townships.

In township 12, range 23, a considerable area of rolling and gently-sloping land was discovered which is attracting the attention of settlers. This land is chiefly in the neighbourhood of the junction of Prospect and Spius creek valleys. It lies at elevations from 3,000 to 3,500 feet above sea-level and has a fertile loam or sandy loam soil. These features suggest that the land would be suitable for dry culture, and the large timber and luxuriant undergrowth suggest great fertility. Four squatters' notices were discovered posted on this land and two more westward up the valley of Prospect creek. It is claimed that the temperatures of this area are not more severe than those in the neighbourhood of Merritt, B.C., the altitude of which is over 1,000 feet lower. I was unable, however, to find any authentic record of temperature to bear out this claim.



Another area of excellent bench land was found at the south boundary of the township and extending southward into township 11, as well as a number of small benches west of Spius creek in township 12. The soil in these areas is sandy loam and at elevations of 3,000 feet and upwards is covered with a luxuriant growth of grasses and shrubs. The main area, however, is about one hundred and fifty acres in extent and lies in the east part of section 4, township 12, range 23. Its elevation averages 2,750 feet above sea-level and it is quite free from undergrowth, being covered with open bull pine timber averaging sixteen inches in diameter. Irrigation of this area could be accomplished from Spius creek. Much good pine and fir was noted in township 12, but the timber in township 11 is small and much of the south part of the township has been burned over. Only a flying examination was made of Prospect valley west of range 23, it being found to contain only steep side-hill lands, except near the head-waters where the elevation was found to be in the neighbourhood of 4,000 feet above sea-level.

The country in the central and south part of township 11, range 23, proving rough and useless, I discontinued work in that locality, and on October 23 moved my party eastward into the valley of Coldwater river and thence southward to a camp in township 9, range 23, where I continued work in the Coldwater valley and in the neighbourhood of Murray lake.

A few acres of good land suitable for hay-growing were found at the north end of Murray lake in township 10, range 23. About fifteen acres of this is slashed and cleared, and some of it planted in hay. The elevation around Murray lake is too great for anything but hay, being 3,670 feet above sea-level. No other agricultural land was found in township 10, range 23. The township is very mountainous throughout, and presents little value of any kind. A detailed examination was not made.

Township 9, range 23, is traversed from north to south through its eastern part by the valley of Coldwater river, which is a narrow valley of bottom land flanked by steep rolling hills. Extending almost to the south boundary of the township this strip of land varies in width from ten to thirty chains, and in one place to nearly one mile, and shows agricultural value throughout. Its soil is composed chiefly of a reddish loam, the appearance of which suggests the presence of a small amount of clay. Certain areas show a gravelly subsoil, but these are not large in extent. Its elevation ranges from 3,180 feet above sea-level, in section 36, to 3,400 feet and upwards in section 2. Hay-growing should be successful throughout, and even the hardier vegetables should do well in the northern part of the valley. There is very little grazing. The value of the timber is small in the northern part of the township, there being a great deal of scrub growth west of the river. There is, however, some spruce, fir and pine fit for railway ties. Much of the land in the centre and south part of the township has been burned over and all the timber destroyed. Settlers are already moving into this valley, and with the completion of the Kettle Valley railway the development of the valley should progress favourably.

On November 2 a heavy snowfall was encountered. I accordingly discontinued work in range 23, and on the 4th moved my party towards Merritt, B.C., where I arrived the following day. On the 6th I sent my pack train, loaded light, overland to Lytton, sent my camp equipage by express and took my party there by train. At this point, not being able to obtain a wagon and team to move my outfit, I was obliged to await the arrival of my pack train, which reached Lytton on the evening of November 7. The next day I moved south to a camp in section 36, township 13, range 27, and continued the examination of lands in the main valley of the Fraser.

Practically no agricultural land of importance was found in townships 13 and 14, west of the river. Bordering, as these lands do, on the mountains of the coast range, they are composed almost entirely of steep rocky slopes rising from the water's edge. There are, however, a couple of small benches adjoining the river and immediately south of Skway-ay-nope Indian reserve No. 26. These benches, having an



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aggregate area of less than twenty acres, are suitable for fruit-growing; a small portion of the area is cultivated and utilized by Indians. The hills are all timbered with small and medium-sized fir and pine.

East of the river in these townships much the same conditions exist, although the slopes are less sharp. For about three-quarters of a mile east of the river the slope is fairly gradual, but at this point the base of the mountains proper is reached. In the southern part of township 13 the mountains rise to eastward, right from the water's edge. An aggregate area of 50 acres agricultural land was found undisposed of in townships 13 and 14 east of the river. This is scattered in various small areas throughout sections 24 and 25 of townships 13, and sections 1, 23, and 25 of township 14. Most of them are occupied, and some cultivated, by Indians. The lands east of the river are all more or less timbered, but on account of the rocky formation the timber is small and scrubby.

On November 12, I moved camp southward to a point in township 12, range 26, east of the Fraser and near the northeast corner of section 19, and continued the examination of lands in this township and in that to the south.

The Fraser valley through these townships follows its general character, although the lands in township 12 have a somewhat gentler slope near the river. In township 12 the lands rise to the east and west from the water of the river, leaving small areas of bench land from one to one and a half miles from the river, from which points the mountains rise steeply through rocky formation. The bench lands in township 12, range 26, to the east of the river, are chiefly small areas of loam and sandy loam soil, at present occupied and in some instances cultivated by Indians, notably in sections 3, 4, 9, 10, 16 and 20. An aggregate area of over three hundred acres in these six sections is agricultural land, all of which is less than 1,600 feet above sea-level. It is claimed by the occupants of these lands that local conditions of temperature render them unfit for fruit-growing in spite of the low altitude. This condition is not consistent with conditions to the west of the river, where a flourishing orchard was found at an elevation only slightly less than that of the greater part of these lands. In my opinion these lands could be utilized for almost any kind of agricultural development. A long narrow bench runs parallel to the river through sections 29 and 31 and contains about seventy-five acres of land more adapted to fruit-growing than to other agriculture. Its soil is a deep sandy loam, with a large amount of surface stones.

West of the Fraser, in township 12, range 26, the lands suitable for agricultural development are fairly well taken up. There remains about one hundred acres of good bench land in section 5, about five acres of which is cleared and the remainder covered with a rather dense growth of small fir, birch and alder. Small benches, to the extent of about forty acres were also noted in sections 8 and 17; all of these are at an elevation suitable for fruit-growing. The timber in this township is of small value except in the area included in timber berth No. 428 and in sections 3 and 9, east of the river, where some good tie timber was seen.

In township 11, range 26, east of the river, only a few small benches adjoining the river were found; the most notable of these lie parallel to the river through section 14, adjoining Boston Bar Indian reserve No. 4. Old buildings there showed past occupation, and in the land south of the reserve some recent improvements have been made. This land shows good deep sandy loam soil and should produce a very good fruit crop.

West of the river a number of benches, having an aggregate area of about two hundred acres, were noted in sections 11, 14, 15, 32 and 33. This land is generally of sandy loam soil with some areas slightly gravelly and stony and all at an elevation suitable for fruit-growing. Portions of this area near the river are open, but most of the area is timbered with a dense growth of young fir, birch and alder. The remainder of the township is timbered throughout, but no timber of merchantable value was noted, it being of a small and scrub variety on account of the rock formation.



At this point, on account of the difficulty in obtaining feed for the horses, and the small amount of land still to be examined in order to close on lands examined by Mr. G. A. Bennett, D.L.S., in 1910, I decided to disband my party and complete the work without their assistance. Having therefore completed as much as could be satisfactorily done from my camp in township 12, range 26, I moved into Lytton on November 22 and, when I had disposed of my outfit, disbanded my party. I then went to North Bend by train and made an examination of the lands east of the Fraser in townships 9 and 10, range 26, and part of the township west of the river.

After a preliminary examination of townships 9 and 10 east of the river, I was convinced that a detailed examination was unnecessary. The valley of the Fraser in these townships presents a much rougher area than that met with heretofore in this season's work. Throughout almost the entire length of the valley in these townships the steep rocky mountainous slopes to the east of the river rise from the water's edge. The only agricultural land noticed has already been disposed of. The lands are timbered throughout, but the timber is similar to the general class on these mountains, being small and scrubby.

Throughout the work of this season many unsurveyed lands were examined and it was necessary to tie these lands to the Dominion system. This was done almost entirely by stadia traverse, which method was found most satisfactory, both as regards speed of operation and accuracy. The elevations determined in the work are all given in feet above sea-level. These were computed from the readings of aneroid barometers which were compared each day with a large stationary aneroid kept in camp. Readings were taken on the camp aneroid every two hours and, by interpolation, practically simultaneous readings were obtained, one aneroid, the stationary, being read at a point whose elevation was known, and another at the point whose elevation was desired, or vice versa. In this way, by a system of back-sights and fore-sights, actual elevations above sea-level were carried throughout the work, it being the rule to first obtain the elevation of the stationary aneroid at camp and compute the other elevations from this known point. Besides the elevations of various points along the main line of the Canadian Pacific railway, which were furnished me with my instructions, the elevations of certain bench-marks determined in the survey of the Canadian Northern Pacific railway in the Fraser valley, of the Canadian Pacific railway in the Nicola valley, and of the Kettle Valley railway in the Coldwater valley in range 23, were used as bases from which to compute elevations of other points.

On November 27, having completed work for the season I returned to Lytton and when I had completed my arrangements there, went to Kamloops, where I spent parts of two days in the Dominion Lands office checking over areas disposed of and not shown on the district plans. I left Kamloops on November 29 for Orillia, Ont., where I arrived on December 4.

I have the honour to be, Sir,  
Your obedient servant,

A. V. CHASE, D.L.S.



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## APPENDIX No. 22.

## REPORT OF G. C. COWPER, D.L.S.

## RESURVEYS IN SOUTHERN ALBERTA.

WELLAND, ONT., February 7, 1913.

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa, Canada.

SIR, I have the honour to submit the following report on miscellaneous surveys and resurveys carried on in southern Alberta last season.

I left Welland on May 3, and reached Medicine Hat with my horses and outfit on the 14th of that month. After spending a few days in Medicine Hat in organizing my party, getting the horses shod and wagons repaired, I left on the 21st for township 19, range 4, west of the fourth meridian, following the main trail from Medicine Hat to the forks of Red Deer river.

For the first sixteen miles from Medicine Hat the country along the trail is very well settled, and the farmers, who go in mostly for mixed farming, appear to be quite prosperous. Farther north the land is more or less hilly and sandy, and has not as yet been taken up. After leaving the settled country, water along the trail is very scarce. My work here was to make a survey of townships 10, ranges 3 and 4, west of the fourth meridian. This was completed on July 8.

My next work was to make a retracement survey of townships 17 and 18, range 3, and a resurvey of township 17, range 4. When these townships were originally subdivided, river lots were laid out along South Saskatchewan river. These lots were afterwards done away with, and the monuments marking them destroyed, but the section lines through the river lots were not run. My work in townships 17 and 18, range 3, was to retrace the lines already run, and to survey the lines which had not previously been run.

To get from township 19, range 3, to township 17, range 3, I found it necessary to move my party eighty miles around by Medicine Hat, as I was unable to find a suitable place to ford the river. The trail from Medicine Hat to township 17, range 3, is the main trail north on the east side of the river. The country is better settled on this side than on the west side, and the land is pretty well taken up as far as township 17.

I commenced the survey of townships 17 and 18, range 3, on July 15, and completed it on August 20. From there we moved into township 17, range 4, the survey of which occupied the party until September 10. This completed my surveys in this district.

These townships, with the exception of township 19, range 3, are admirably suited for ranching, which is the main occupation of the settlers. Townships 17 and 19, range 4, are practically all under lease for ranching purposes. Township 19, range 3, with the exception of a few sections on the south side of the river, is practically all sand hills, and willow and rose-bush scrub, with a few scattered poplar trees.

Townships 17 and 18, range 3, have been under leases for ranching, but as the leases are expiring the homesteaders are taking up the land. While I was camped in township 17, range 3, six quarter-sections were filed on in this township. The soil being a mixed sandy and clay loam is well suited for farming, but the rainfall is light.



It is commonly believed, however, that as the land becomes broken the rain increases, and if this be the case the homesteaders here should meet with success, especially if they go in for mixed farming. The country is all prairie, and, with the exception of a little scrub in the coulées, and a few trees along the river, there is no wood.

The Saskatchewan, which cuts all the townships we worked in with the exception of township 19, range 4, has high cut banks from four to five hundred feet in depth, with deep coulées running back from the river. The current varies from about four to eight miles an hour, and in some of the rapids exceeds even this. During the past season a number of settlers taking up land at the forks of Red Deer and Saskatchewan rivers used the river to float down their lumber and supplies from Medicine Hat.

A large number of rattlesnakes frequent the shores of the river, and during the time we were working there my party killed over three hundred of them.

My next work was to survey some lines in townships 21 and 22, range 10, west of the fourth meridian, which had not been previously run owing to the fact that river lots had been laid out along Red Deer river. I took the party back to Medicine Hat and followed the Canadian Pacific railway as far as Carlstadt, from which place we turned north, reaching township 21, range 10, on September 17.

Owing to a number of homesteaders being absent I could not get them to agree to my erecting monuments which would affect their boundaries, and consequently was unable to erect a number of monuments marking my survey. I therefore left blank petitions for resurveys in both townships.

These townships are fairly well settled, some of the settlers having lived there four or five years. The crops on the whole were very good, flax, running eighteen and twenty bushels to the acre, while potatoes and other vegetables did very well. On the north side of the river the settlers have great difficulty in getting water, and the majority of them have to haul all the water they use from the river. The Government drilled a well over 300 feet in depth but the water found was not very good.

After completing these surveys, I returned to Medicine Hat, disbanded my party on October 4, and put my horses out for winter. One of my assistants went with Mr. Deans on inspection work in Manitoba, and with the other I started out to do miscellaneous surveys.

My first work was to investigate a lake in section 3, township 10, range 12, west of the fourth meridian. I found that it had dried up and that the whole section was suitable for farming purposes.

My next work was the survey of an island in Beaver lake in township 51, range 17, which I completed on October 22. I then went to Heath to investigate Barnes lake in section 1, township 44, range 5. I found it to be incorrectly shown on the township plan, but owing to it being surrounded with thick brush and scrub, and being unable to hire any axemen, I left the traverse until the lake froze over. I then returned to Edmonton and retraced that portion of section 24, township 53, range 27 which was formerly part of the Michel Calahoo Indian reserve. I made this survey on October 31 and next day drove to section 32, township 51, range 26, and made a survey of a lake in this section on November 2.

I then investigated Sullivan lake in section 2, township 36, range 14, and finding that there was some dry land in the section I made the necessary surveys on November 6.

I next went to township 40, range 5, and surveyed a lake in section 18 on November 9. Returning to Heath I found Barnes lake frozen over and traversed it on November 12, leaving for Edmonton the next day.

Here I found instructions to complete some traverses in township 60, range 1, and townships 64, ranges 4, 10 and 12, west of the fourth meridian.

After securing a small camp outfit, we left Edmonton on November 13 for Lloydminster, and from there we drove to Onion lake, where we secured a team and half-breed driver. We followed the main Cold lake trail as far as Angling lake, where



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we turned off to do the work in township 60, range 1. From there we had to pack for six miles to get to the work, which we completed on November 27. We then returned to Angling lake and reached the south end of Cold lake on November 29. From this place we found a trail to township 64, range 4, and finished the survey there on December 1.

To get from township 64, range 4, to township 64, range 10, I found it necessary to return to Cold Lake mission and follow the St. Paul trail as far as Rife, from which place we turned north. There is, no doubt, a direct trail from Cold lake to lac La Biche, but owing to the lateness of the season and the small amount of feed for the horses which we were able to carry, it was imperative that we keep as much as possible to settled districts. We reached township 64, range 10, on December 7, made the required survey that day, and the survey in township 64, range 12, on December 9. We then started back for Edmonton and reached St. Paul de Metis, a busy town of about three hundred people, on December 12. I sent the team and teamster back to Onion lake and, with my assistant, took the stage to Vegreville, arriving at Edmonton on December 14.

The country north of Saskatchewan river is very well settled, and I was surprised at the prosperity of the farmers, some of whom, although over 100 miles from the railroad, have good buildings and all the conveniences of a farmhouse in Ontario. With the completion of the railroad from Battleford to Edmonton this country will make rapid progress.

I closed operations for the season at Edmonton and reached Welland on December 23.

I have the honour to be, Sir,

Your obedient servant,

G. C. COWPER, D.L.S.



## APPENDIX No. 23.

## ABSTRACT OF THE REPORT OF W. J. DEANS, D.L.S.

## INSPECTION AND MISCELLANEOUS SURVEYS IN MANITOBA AND SASKATCHEWAN.

I left my home on May 28 for Prince Albert, where I intended to organize my party. Owing to the lateness of the season and the scarcity of labour it was June 5 before I left there for Shellbrook, where I procured my horses and outfit. On June 9, I started for contract No. 11 of 1911 in the vicinity of Boutin, where my inspection work was to begin.

The country between Shellbrook and Boutin is well adapted for agriculture and is being rapidly taken up by a good class of settlers. There are, however, many homesteads in this district which are still available.

On June 13, after a pleasant trip over a good trail, I arrived in township 54, range 8, west of the third meridian, which forms part of contract No. 11 of 1911.

The land comprising this township and townships 53 and 55 is generally adapted for mixed farming purposes. The soil is good and there is an abundance of hay in the marshes, and good water in the numerous lakes, while suitable timber for building purposes may be obtained in many places. The Big River branch of the Canadian Northern railway is located a short distance east, which makes access to the markets easy and certain at all seasons of the year.

My next work was to correct the road allowance between townships 50 and 51, range 12, west of the third meridian. On June 19 I started for this place over the Green Lake trail, which I found in good condition. I travelled on this trail about thirty miles, then forded Big river and passed down the west side of Witchekan lake. There is an extensive area of good agricultural land west of the lake, mostly open prairie with light poplar scrub in places. I did not see any settlers, although this land is open for homesteading. About half way down the lake on the west side we came across numerous wicker and rustic structures which had been erected recently by the Indians.

On June 21, I arrived in township 51, range 12 and next day started to resurvey both sides of the road allowance between townships 50 and 51, which had been left too wide when the townships were subdivided. While on this work we had some heavy gales which blew down trees in all directions, and also our tents. These winds were followed by cold rains which made our progress slow, so that work which could have been completed in a week under ordinary weather conditions required twice that time.

I also made some other corrections in this vicinity, and on July 14 started for Shellbrook. On my way I branched off at Mistowasis to investigate the marking of the post at the northeast corner of section 12, township 49, range 9, west of the third meridian. I found that this post had been correctly marked.

There is quite an extensive unsettled country west of Mistowasis which is open for homesteading. The country is somewhat broken with ridges and sloughs and covered more or less with small poplar and willow, but the soil is a good black loam. Pea-vine and grass grow in great luxuriance throughout the district and the sloughs are full of good water, which makes this a splendid country for mixed farming and cattle raising.

On July 22, I arrived at Shellbrook and on the 24th shipped my outfit by the Canadian Northern railway to Tisdale, at which place it arrived on July 31.



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On August 1, I started for Arborfield from which place I sent in a portion of my party with pack-horses to inspect the northerly part of contract No. 7 of 1911. The country between Arborfield and Tisdale is fairly well settled, but there are still quite a number of homesteads open for entry. The soil generally is a black loam with clay or sand subsoil and produces crops of wheat, barley and oats which could not be excelled anywhere. There is an abundance of wood suitable for fuel, and plenty of timber for building purposes. The trails and roads are good. The settlers have good buildings, and schools and churches are within easy reach of all. The water in the numerous streams is good, and grass and wild pea-vine grow luxuriantly. Horses, cattle, sheep and hogs all thrive in this district. Wild fruit, such as raspberries, grow in great profusion. We passed a great many berry pickers on the road all laden with large quantities of berries. A settler coming to this part of Saskatchewan who possesses ordinary intelligence and industry would have a competence in a few years, for nature has certainly distributed her bounties with a generous hand. There are a great many homesteads available east of Arborfield and a number of settlers were engaged cutting a trail into township 48, range 10, west of the second meridian, so that now these new lands are easily accessible.

On August 8 I started for Tisdale, arriving there on the following day. From there I shipped my outfit to Mistatim in order to continue my inspection of contract No. 7 of 1911. Owing to the great rainfall in July and August, the country around Mistatim was very wet, and I found it a most difficult undertaking to get into contract No. 7, even with pack horses. I finally cut a trail to the northeast corner of township 45, range 10, from which point I conducted most of my inspection.

The surface of the land in the southerly part of contract No. 7, *i.e.*, in township 46 and the northerly part of townships 45, ranges 9 and 10, and around Mistatim is gently rolling and covered with a thick growth of poplar and small birch, with patches of spruce suitable for sawlogs. There are many sloughs, marshes and small lakes throughout the district. Grass and peavine grow very rank. This will be a good mixed farming country when cleared and drained. There is a saw-mill at Mistatim which runs during the summer months and employs a large number of men. This company was unable to obtain sufficient help last season, although they offered \$2.50 per day for labourers. There are no settlers around Mistatim engaged in farming, although there are many homesteads which would be productive with little labour, and as all produce has to be brought in by train a settler engaged in farming would be sure of a good market for any produce.

On August 23, I shipped the outfit by Canadian Northern railway to Portage la Prairie, where it was decided to leave it temporarily while I proceeded with the inspection of contract No. 19 of 1909 in townships 7 and 8, ranges 16 and 17, east of the principal meridian. I accordingly left for Kenora, where I hired a gasoline launch and went up to Indian bay, the extreme westerly part of Shoal lake.

I arrived at this contract on August 31, and on September 2 started the inspection. The greater part of the contract consists of tamarack muskegs, willow swamps and rocky ridges covered with scrub jackpine. The heavy rains of July, August and September filled the muskegs to overflowing, so that the inspection of the contract was very difficult. In addition to the rain we had three days of snow and sleet near the end of September, all of which interfered with the progress of our work. I also surveyed timber berth No. 1903, which is situated in this contract.

On September 27, I started for Kenora with my outfit loaded on a gasoline launch and barge. The lake got so rough that we were in danger of being swamped, so we had to put into an island and unload the men and outfit. Having done this, I started with two men in the launch, and, after a stormy time, reached Kenora that night. The next day I sent out a launch and brought the outfit and party in.

My next work was around Brereton lake. Certain lands in this district were urgently required, and before they could be dealt with it was necessary to have a



survey made and confirmed. I also had to inspect contract No. 1 of 1911 and contract No. 24 of 1908 in this vicinity. The lands throughout these two contracts consist largely of tamarack muskegs, willow swamps and rocky ridges. In the westerly part of contract No. 24 there is some land suitable for farming purposes and in many places throughout both contracts there are small patches which would produce potatoes and garden vegetables in favourable seasons. Brereton lake is a fine sheet of good pure water about three and a half miles long by one and three-quarter miles wide, situated about seventy miles east of Winnipeg, and easily reached by the Grand Trunk Pacific railway. In many places around the lake the beach is sand, and there are seventeen islands of various sizes and shapes. Maskinonge are quite plentiful in the waters of the lake, and attain a great size. Moose and elk were seen nearly every day while we were engaged in this vicinity. This lake will no doubt become a favourite summer resort for the people of Winnipeg. The work around Brereton lake required a long time to complete on account of the wet nature of the country and the exceptionally wet season. In November we had sufficient frost to freeze the muskegs and marshes a little but not sufficient to carry the weight of a man. Breaking through the ice in a muskeg for the greater part of the day makes the carrying out of a survey very slow.

On December 14, I started with a portion of my party for Portage la Prairie, leaving my assistant and the remainder of the party to finish some work near Ophir. I shipped my outfit which had been previously left at Portage la Prairie to Glenella, where I was joined by my assistant and the remainder of my party. Here I procured two sleighs and some supplies and started north to inspect contract No. 5 of 1912, which lies northeast of lake Manitoba. This contract consisted of townships 21, ranges 11, 12 and 13, and townships 22, ranges 12 and 13, west of the principal meridian. These townships formerly formed a part of the Manitoba West Forest reserve. The land is gently-rolling with ridges running in a northwesterly direction, and contains many hay marshes. In many places there are quite large open tracts of prairie, but generally the land is covered with a thick growth of small poplar and willow; in the northerly part there are a number of fairly large bluffs of spruce from eight to twenty-four inches in diameter. The soil is good, and water of the best quality is easily obtained by digging a few feet. It is expected that a branch of the Canadian Northern railway will soon be extended through this district. This would make the transportation of crops and produce to markets easy.

My next work was to examine a part of contract No. 11 of 1912, consisting of townships 23, ranges 12 and 13. The land in these two townships is much the same as in contract No. 5.

On January 5, 1913, I started with my outfit for contract No. 12 of 1912. I stayed for a day at Ste. Rose du Lac to procure supplies, and on January 7 started out for Toutes Aides, a post office on lake Manitoba. The travelling was slow on account of deep snow and very cold weather. There is an extensive country north of Ste. Rose du Lac between lake Manitoba and Dauphin lake, in which there are many homesteads available for settlers. The land is rolling and covered with willow and poplar scrub, with many patches of open prairie and hay marshes. In some places there are large bluffs of poplar suitable for building purposes. It is expected that a railway will soon run through this part. On January 10 we passed a number of fishermen engaged in their work. One of these men told me that he had taken over three hundred dollars' worth of fish in less than a month.

On January 11 I arrived on contract No. 12 and commenced my inspection on the 13th. Afterwards I inspected the remainder of contract No. 11 of 1912 and contract No. 10 of 1912.

These three contracts adjoin the northerly shore of lake Manitoba and stretch from Waterhen river to Portage bay. The whole district is generally level and covered with willow and small poplar, with patches of spruce, tamarack and jackpine,



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which in places is large enough for sawlogs. There is an abundance of hay throughout the district, and the soil is good. Fish are plentiful in the lake and can be disposed of at a good price. Moose and elk are numerous. This district offers great inducements to the settler who wishes to engage in mixed farming or cattle raising.

On February 5, having stocked up with supplies and feed for the horses at Fairford, I started for contract No. 9 of 1912 and completed the inspection on the 12th. It was now necessary for me to cut about twelve miles of trail in order to inspect contract No. 8 of 1912, and as the weather was very stormy and the snow deep, I was somewhat delayed and did not arrive on this contract until February 19. I completed the inspection on the 22nd.

The country east of lake St. Martin for a distance of three or four miles is level, with many marshes and tamarack muskegs. Thence it ascends in flat ridges covered with jackpine. This part of the country was burnt over a few years ago, so that in many places there are large tracts of land on which the jackpine is from two to four feet in height. There are, however, many fine groves of jackpine from eight to twelve inches in diameter which escaped the fire. In township 29, range 5, west of the principal meridian, there is some land suitable for mixed farming, but the chief asset of this district at present is the jackpine and tamarack, which would make cordwood and ties.

In order to reach contract No. 7 of 1912 it was necessary for me to cut twelve miles of trail, a good deal of it through windfall. This, with deep snow, impeded my progress so that it was not until February 27 that I reached this work. I travelled through this contract easterly a distance of twelve miles cutting trail the greater part of the distance. I finished the inspection of this contract on March 15, after which I inspected contract No. 6 of 1912.

The land in townships 28, range 3, 4 and 5, west of the principal meridian, is generally gently rolling and covered in the northerly part with a thick growth of poplar and spruce, which in some places is large enough for sawlogs. The southerly part of township 28, range 3, is very wet. There are a number of muskegs on both sides of Mantagao river, a small stream about fifty links wide, which flows northerly into lake Winnipeg. There is some good farming land in township 28, range 4. If Mantagao river was opened up a little, much of the adjoining land would make splendid hay meadows, on which hundreds of cattle could be raised.

On March 13, I moved camp to section 33, township 27, range 3, and corrected the marking on the monument at the northeast corner of the section. I had intended to return to Moosehorn, but owing to the depth of the snow and the scarcity of horse feed I thought it advisable to come out to the nearest settlement, where I would have good trails and plenty of hay and oats for the horses. I therefore came out to Fisher River settlement and thence to Arborg, the terminus of the Arborg branch of the Canadian Pacific railway. From there I proceeded to Portage la Prairie, where I stored my outfit.

The season was not a good one for field work. In July, August and September the rainfall was excessive so that progress was very slow, and as all the muskegs and marshes were full of water, wading through them in October and November was cold work. December, January, February and March were, however, very good months for working; the weather although rough did not seem to be excessively cold or stormy. I paid my party off on March 19 and arrived in Brandon on the 22nd, having been nearly ten months in the field.



## APPENDIX No. 24.

## ABSTRACT OF THE REPORT OF S. L. EVANS, D.L.S.

## MISCELLANEOUS SURVEYS IN SOUTHERN SASKATCHEWAN AND ALBERTA.

My first work for the season of 1912 was in the Maple creek district where I made retracement surveys of township 8, range 22, townships 6, ranges 24, 25 and 26, township 7, range 28; and part of township 6, range 27; all west of the third meridian.

These townships lie to the south of Cypress hills, a range having an altitude of about 3,000 feet above sea-level.

At present, ranching is the chief industry of the district and some large and successful ranches are located on Whitemud river which runs through some of these townships. A few scattered quarters have also been taken up by homesteaders. To the south of these townships there are large settlements and, according to reports, the settlers are making a success of farming.

The soil generally is of a gravelly nature and this, coupled with the dry climate in this district, would seem to indicate that dry farming operations would have to be practised by homesteaders wishing to make a success of farming. I am, however, of the opinion that the district is best adapted for ranching purposes. Cattle and horses thrive well the year round on the native short sweet grasses.

Cypress lake, which is about six miles long by two miles wide, and the head of Frenchman river, is located in township 6, range 26. I believe this lake has been considered by the Irrigation Department as being suitable for a large reservoir for irrigation to serve the country lying to the south and east of the lake. This district would no doubt be much improved for agricultural purposes were this irrigation scheme carried out.

Along the bank of Frenchman river, large outcrops of a white clay appear. This clay is said to be excellent for pottery purposes and awaits development along this line.

Outcrops of lignite coal were seen on the north branch of Battle creek in township 7, range 28. There is very little bush in any of these townships, and the coal is thus a great boon to the homesteaders.

A great many antelope roam in this district, as many as thirty in a drove being seen by my party.

The Weyburn-Lethbridge branch of the Canadian Pacific railway is being built through this district. This will no doubt add a further incentive to agriculture.

In July the work in Maple creek district was suspended for a time and we proceeded to township 13, range 14, west of the third meridian, where some retracement surveys were required. We drove across country, a distance of about one hundred miles, following good roads and trails for most of the way. This township is well settled, mostly by Germans, and mixed farming is being carried on quite successfully. It may be noted that the rainfall is heavier in the districts east of the Maple creek country.

Towards the end of September I shipped my outfit to High River settlement for the foot-hill work, and on September 28 started by wagon for the northeast corner of township 20, range 5, west of the fifth meridian. This was readily reached by road to Okotoks, thence by trail up the north branch of Sheep river.

After running the east boundary of township 20, range 5, I proceeded to the northeast corner of township 20, range 6. To establish a camp near our work here we had to pack our tents and outfit ourselves.



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The country is very rough and broken and lies close in to the Rockies. The north-east corner of this township is at an elevation of nearly 7,000 feet.

The survey of the east boundary of township 19, range 5, and the subdivision in township 19, range 4, was carried on from camps located on the south branch of Sheep river.

Some good seams of coal outcrop on the banks of both forks of this river.

The country is too broken and rough and is at too high an elevation for agricultural purposes. For the most part the surface is covered with second-growth jack-pine and small spruce.

The streams are very swift and no doubt offer possibilities in the way of future power development.

We had a considerable fall of snow during November, and owing to scarcity of horse feed we left on November 20 for High River settlement, where the party was disbanded.

I then proceeded with my assistant to Macleod for the traverse of Oldman river in townships 9, ranges 25 and 26, west of the fourth meridian. This was completed on December 17, and on the following day I left for home.



## APPENDIX No. 25.

## ABSTRACT OF THE REPORT OF J. A. FLETCHER, D.L.S.

## OBSERVATIONS FOR LATITUDE.

Before commencing the season's field work I went to Toronto, on April 23, 1912, to make a determination of the constants of dip circle, T.S. No. 62. I was required to observe for magnetic dip and total force wherever possible during the season, and it was necessary to determine the constants of the statical needle both before and after the season's work. These constants were determined with the required precision by April 30, and I left that evening for the West.

I arrived at Salmon Arm, B.C., on May 4, and I found the weather at that time of the year to be very delightful. Rain falls in this vicinity in sufficient quantity to obviate irrigation, while the extreme moisture of the coast is escaped. The settlers here seem quite prosperous, the chief industries being fruit, hay and vegetable growing and dairy farming. Fruit, such as apples, pears, plums, peaches, cherries and the small fruits all mature well. Considerable cloudy weather was met with here and the observation was delayed somewhat on that account, but by June 3 it was completed.

I proceeded next to township 61 on the second meridian. I went by way of Regina, Prince Albert and Hudson Bay Junction to Pas, where I arrived on June 11. The same evening I left for Cumberland on a steam tug and scow owned by Captain Ross, who makes freighting trips up and down Saskatchewan river all summer. In this instance he had been engaged by the Hudson's Bay company to tow four of their York boats across Namew lake on their way to Pelican narrows and Churchill river. I accompanied them up the lake as far as the point projecting from the western shore in township 60. From there I proceeded to the point of observation on the second meridian in township 61, using a twenty-foot freight canoe kindly loaned me by Mr. E. M. Joyal.

On arrival at the point of observation, a space was cleared of trees and rubbish and the foundation prepared for the telescope. Some trouble was experienced in getting a good set up as frost almost a foot thick was still in the ground. By digging three holes for the tripod through the frost and packing the holes with beach sand, a very stable foundation was secured. The temperature while here was the highest experienced all summer, the mean of the temperature while observing at night being 58°. Several jackfish and pickerel were caught here with a line.

This observation was completed by June 28, and the return to Pas was made by canoe all the way, travelling on the lake only in fair weather. We entered Tearing river at eleven o'clock, and arrived at the Saskatchewan by four. Tearing river is very swift in some places, and only in high water does the steamboat use this channel. We reached Pas on July 4.

I proceeded next to Prince Albert and hired a wagon, team and teamster to take my outfit to township 57, on the third meridian. The trail which, on account of the wet season, was in some places difficult to travel, passes through a heavy clay loam for about two miles after leaving Prince Albert, and then crosses country generally with light or sandy soil. In the sandy districts the rain improves the travelling as the sand, when wet, is firm. While going north, Red Deer river was in its normal condition, and the river was crossed with no damage to the outfit, the water coming only to the wagon box. North of this the trail becomes worse, being quite stony in places, while several short and rather soft muskegs were crossed, some of them requiring brushing.



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Owing to the heavy rainfall of June and July, mud holes were numerous on the final third of the trip. We arrived at the third meridian in three and a half days from Prince Albert and a good observation spot was at once chosen. Much rainy weather was experienced here, but by July 27 sufficient observations had been taken and the return journey commenced. The recent rains had flooded Red Deer river to an unusual height, but it had abated somewhat on our arrival. It was necessary to swim the horses and raft the outfit across; this was accomplished without difficulty or damage to the outfit although the water was about nine feet deep. Rabbits, partridge and prairie-chickens appeared to be numerous in this district.

I next proceeded to the sixth meridian in Jasper park by way of Edmonton and the Grand Trunk Pacific railway. At that time fully-equipped passenger trains were running as far as Fitzhugh in the Yellowhead pass. I left the train at the Jasper park collieries, the post-office of this place being Pocahontas. This was not at first intended as a regular stop by the Grand Trunk Pacific railway, but owing to the development of the coal mines in the neighbourhood, the traffic seemed to warrant it. The company in charge is developing these mines to a considerable extent and is producing a fine quality of steam coal. The trail runs westward from the collieries about three and a half miles and there crosses Athabaska river by ferry, and proceeds westwards along the north side of the river. The sixth meridian crosses a large level flat, partially timbered, in township 48. I selected my observation station here owing to the level nature of the country and the apparently equal distance from the mountains to the north and south. The point of observation is about a mile from the ferry, and near the trail. The observation was completed by August 22 and the return trip to Edmonton made at once.

I proceeded next to Calgary to observe on the fifth meridian near triangulation station No. 1. This observation was completed on September 12.

On the receipt of a telegram requesting me to observe at the triangulation station on Sugarloaf mountain, I left for Enderby, from which place the station is reached most conveniently. The trail to Salmon Arm passes south of Sugarloaf mountain, but a branch trail east of the hill passes within half a mile of the summit, which is easily reached by pack horses from that side. Mr. M. P. Bridgland, D.L.S., loaned me his packer and ponies to place the Zenith telescope outfit on the hill. I observed for latitude on the summit in the immediate neighbourhood of the triangulation station. The crops near Enderby were very good last year, fruit, potatoes and market garden crops all being plentiful, and hay of good quality and quantity is grown on the level lands.

On completing the observation here, I returned to Toronto and after a redetermination of the dip circle constants was made, I left for Ottawa, where I arrived on October 25.

The following are the results of the observations on the initial meridian:—

The northeast corner of section 13, township 61, on the second meridian, as defined by its witness post, is 0.25 chains too far north.

The northeast corner of section 13, township 57, on the third meridian, is 0.31 chains too far south.

The northeast corner of section 13, township 48, on the sixth meridian, is 5.67 chains too far north.

Thirty observations for magnetic dip and total force and twenty-nine for magnetic declination were taken during the season.



## APPENDIX No. 26.

## ABSTRACT OF THE REPORT OF L. E. FONTAINE, D.L.S.

## INSPECTION OF CONTRACT SURVEYS IN ALBERTA.

My field work for the season of 1911 was not finished until February 10, 1912, and from that date until the middle of March my time was occupied in preparing reports on the contracts inspected.

On March 21, I left Edmonton with one assistant and one chain-bearer to examine some corrections which had been made in contract No. 23 of 1909.

When returning from this inspection I passed close to certain townships in contract No. 20 of 1911, and although I knew that the work was not completed, I decided to traverse part of Saskatchewan river in township 39, range 9, west of the fifth meridian, as conditions were very favourable for doing the work.

I then returned to Edmonton on April 4 and after organizing my party proceeded with the inspection of contracts Nos. 25, 26 and 28 of 1911, in the vicinity of Edson, completing the work on July 12.

After reorganizing my transport outfit at Edmonton, I left on July 19 for the Peace River district to inspect contracts Nos. 1, 2, 3 and 4 of 1912 travelling via Athabaska Landing, Mirror Landing, Grouard, Peace River Crossing, Dunvegan and Grand Prairie. When this work was completed I returned to Edmonton on November 18, via Edson, and paid off my party.

On November 25, I left for township 42, range 28, west of the fourth meridian, to resurvey the north boundary of the township but owing to an accident to my transit I was unable to complete the work. I therefore closed operations and left for home, arriving there on December 12.



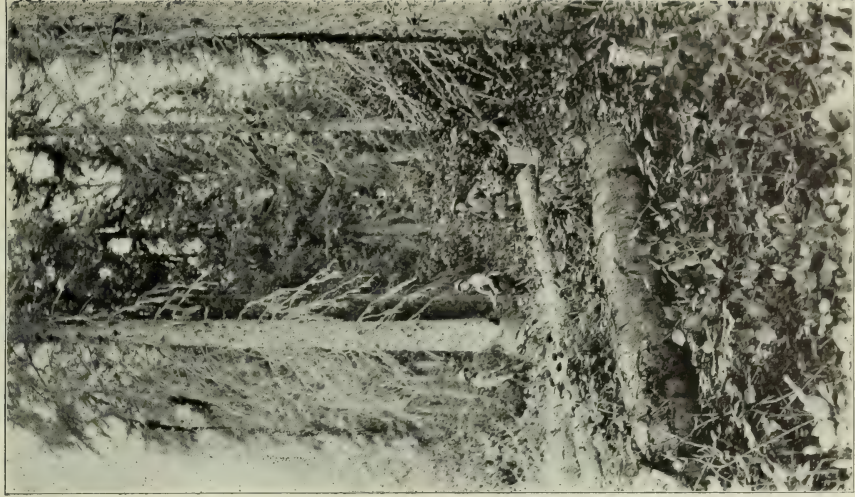


Photo by A. H. Hawkins, D.L.S.  
Twenty-Third base line west of the Fifth Meridian  
Range 18.

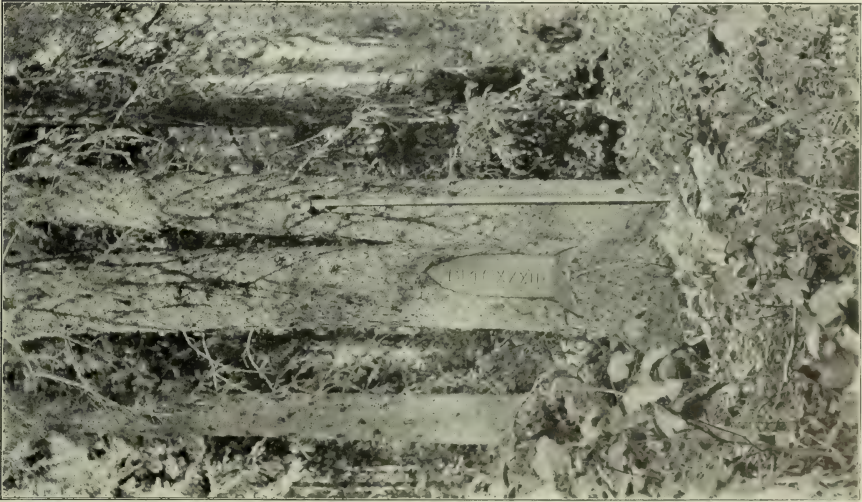


Photo by A. H. Hawkins, D.L.S.  
Bench Mark on Twenty-third base line west of the  
Fifth Meridian.







## APPENDIX No. 27.

## ABSTRACT OF THE REPORT OF C. A. GRASSIE, D.L.S.

## SUBDIVISION SURVEY IN JASPER PARK.

I have the honour to submit the following report of surveys performed in the Yellowhead pass district during the past season.

My work consisted of subdividing lands along the Canadian Northern railway now under construction, within the limits of Jasper park.

After a few days spent in organizing my party, I left Edmonton on June 10 via the Grand Trunk Pacific railway for Hinton, arriving there on the same day. We were delayed there two days waiting for the arrival of our supplies. On June 13 we proceeded by pack-train to township 49, range 27, west of the fifth meridian, camping on the right bank of Athabaska river near the mining village of Pocahontas.

From this camp we began subdividing in townships 49, ranges 27 and 28. The river traverses the lands that were to be subdivided. A considerable part of the low-land along the river was covered with water to such a depth that we were forced to abandon the work, leaving it to be completed later in the season when conditions would be better for surveying. We succeeded, however, in running two lines across the river.

The Jasper Park Collieries Company, Ltd., employ several hundred men in their coal mines in this district, and have been shipping coal for some time. The coal is bituminous. During the autumn and early winter of the past year they made extensive improvements to their plant, having built a large tippie and power-house. The Grand Trunk Pacific railway passes through township 49, range 27, following the right bank of the river.

On July 4 we moved camp to the west shore of Brulé lake, an expansion of Athabaska river. We transported the camp outfit and supplies across the river by boat, but had to send our horses around by way of Prairie creek on account of not being able to find a suitable place to swim them across the river.

In this district we subdivided those parts of townships 49 and 50, range 27, which are adjacent to Brulé lake. A good wagon road from Prairie creek follows the western shore of the lake to its head. The foot of Bullrush mountain is very close to the lake at the southern end, leaving only a narrow strip of valley between it and the lake shore, but this strip gradually widens towards the north.

The land is rolling and covered with small poplar and spruce. The soil consists of a sandy loam and clay mixed with sand. It would produce small fruits and vegetables, although light frosts occur in June. I chanced on a small garden in which all varieties of vegetables were grown with success. Wild strawberries were very plentiful.

Along the shore of the lake there is a strip of timber, chiefly spruce. Solomon and Moose creeks abound with trout for some distance up from their mouths.

The grade of the Canadian Northern railway, which follows closely the west shore of the lake, is nearly completed. Looking toward the east from the higher lands one gets an extended view of the lake and of the foot-hills, covered with forests of green spruce, while towards the west rises Bullrush mountain.

Brulé lake is being filled in with sediment brought down by the river, and consequently is very shallow. In autumn and winter when the water is low, the greater part of the bed of the lake is dry.

After completing the work in township 50, we continued our surveys in townships 49, ranges 27 and 28. Considerable difficulty was encountered in running the



subdivision lines across the Athabaska, as the river here is divided into several channels by islands which are covered with scrubby spruce and a thick undergrowth of brush, and contain swamps in their interior.

The land on the south side of the river is flat and low, being partially flooded during the time of high water, while that on the north side is rolling and hilly and covered with a scattered second growth of jackpine and spruce. A great part of these lands on the north side of the river and in the valley of Moose creek is leased for coal claims. The Jasper Park Collieries Company, Ltd., are developing their coal claims in township 49, range 27.

We also surveyed sections 24, 25 and 36 in township 49, range 1, west of the sixth meridian, and resurveyed the sixth meridian from the thirteenth base through township 49.

Bears and deer are plentiful in this district. The soil is clay on the high lands, while that of the low lands is clay and sand. Bordering the river, there is a narrow strip of timber consisting chiefly of spruce varying from four to eighteen inches in diameter.

On August 30, we began the subdivision of lands along the western shore of Jasper lake, and in townships 47 and 48, range 1, west of the sixth meridian. Jasper lake is also an expansion of Athabaska river, and, like Brulé lake, it is being filled in with sediment brought down by the swift waters of the river. During the time of low water, much of its bed is uncovered. Its banks on the west are high and steep, while on the east they are low. Immediately to the east, and separated from it by only a narrow strip of land, lies Talbot lake.

The country is rolling and hilly, and most of that part of township 48 which we surveyed is brulé, many fire-killed trees still standing. In some places windfall lies thickly on the ground. Rocky foot-hills rise from the shore at the head of Jasper lake, but farther south the valley widens again and the country is covered with small spruce and poplar. Part of section 5 township 47 is swampy and, in the western part, timber was seen up to three feet in diameter. Stony river flows through the northern part of township 48. It is a turbulent and swift-flowing river, whose waters flow through a deep and narrow channel until they near the sixth meridian where they spread out over a wide bed with low banks.

From this work we proceeded to Fitzhugh, a divisional point on the Grand Trunk Pacific railway, and situated on the left bank of the Athabaska. Here we surveyed the east and south boundaries of section 9, township 45, range 1, west of the sixth meridian. Miette river flows through this section. That part south of the Miette is brulé sparsely covered with small poplar, and that north of the river by jackpine. Along the banks there is spruce and fir, up to two feet in diameter. The Athabaska flows through the southeastern part of the section. The land here slopes sharply towards the river. The soil is a sandy loam with a gravel and stony subsoil.

Our next work was the survey of those sections in townships 45, ranges 2, 3 and 4, through which the Canadian Northern railway is being constructed. The land surveyed lies in the Miette valley, on the south side of the river. The valley is narrow, the mountains on the south rising almost immediately from the edge of the river. The greater part of these lands, therefore, is on a mountain slope and is exceedingly rough and rocky. In range 2 they are thickly wooded with small spruce and jackpine. In ranges 3 and 4 there is spruce and balsam timber varying from four to eighteen inches in diameter. The north side of the valley is mostly brulé, with scattered jackpine and spruce. A wagon road from Fitzhugh follows the river closely.

The summit of the Rocky mountains was traversed through sections 13 and 24, range 4, west of the sixth meridian. In sections 13 the summit is very much broken and was difficult to follow.

After having completed the survey of subdivision lines in this district we traversed Miette river from the east boundary of section 7, range 2, to its mouth, and



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the Athabaska through townships 45 and 46, range 1, west of the sixth meridian; also of the Rocky and Stony rivers through subdivided land. Most of the traversing had to be done on the banks of the rivers, as very little ice had yet formed.

We completed the traverse of Stony river early in December, but were unable to ford it on account of its flooded condition, due to a blockade of ice. We were therefore unable to finish the surveys in township 49, range 27, west of the fifth meridian.

We accordingly ceased operations and took the train at Pocahontas for Edmonton. Arriving there on December 11, I disbanded my party, and having stored my outfit I left for Medicine Hat on December 17.



## APPENDIX No. 28.

## ABSTRACT OF THE REPORT OF A. H. HAWKINS, D.L.S.

## SURVEY OF THE TWENTY-THIRD BASE LINE WEST OF THE FIFTH MERIDIAN.

My work during the season of 1912 consisted of the survey of the twenty-third base line, from the fifth to the sixth meridian.

By arrangements made in 1911, hay was put up for use on this line, at Quitting lake in range 3 and also at Peerless lake, range 5, and caches of provisions were arranged for on Peerless lake, on Otter lake in range 13, and on the Peace river at the mouth of Whitemud river, in range 21. Arrangements were also made to have a sleigh road cut from Lubicon lake on the twenty-second base line, to Otter lake on the twenty-third.

The party left Edmonton, by wagons, on March 11, and were met at Athabaska landing by my packer who had been sent in some time previously in order to have certain horses from the pack-train put into harness, as it was found to be a difficult matter to secure freighters to go in the required distance, except at very advanced rates; however, as arranged, the sleighs were ready and the party left Athabaska Landing by way of Athabaska river, on March 16, passing Fish Camp, Calling lake, Rock Island and Pelican or Wabiskaw mountains en route.

The road up the southern slope of these hills is well located but, from the summit to the foot of the northern slope, the locator evidently had little or no regard for grades, steep pitches, or sharp turns, which are far too numerous, and, moreover, are not necessary. However, the party succeeded in overcoming these obstacles, and reached Wabiskaw on March 22. After making some necessary repairs, we continued our journey northward, following the winter road put in by the Hudson's Bay company and Messrs. Revillon Bros. to the Trout Lake trading post. This was the last outpost of a very limited civilization, that we were to visit for some time.

From this place our route followed the east shore of a small lake, locally called Trout lake, to where a stream flows into it at the northeast extremity, and thence up this stream and across a small lake locally known as Island lake. A trail was cut from the north shore of this lake to the east side of Quitting lake and camp was established near the north shore of the latter. By observing, it was ascertained that the camp was very near the latitude of the twenty-third base line.

Our sleighs were sent back from this place, and a trail started eastward to the starting point of the survey on the fifth meridian, and as the snow was still from one to two feet deep in the woods the task was a very laborious one. It was not until April 8 that the party were in a position to start the base line westward.

During the first few weeks the work was rather slow and disagreeable on account of the deep snow, and on April 11 a violent snowstorm prevented work for two days.

Peerless lake, or, as it is called locally, Trout lake, situated in range 5, was reached on May 4, which was not a moment too soon, as the ice was beginning to be very much honeycombed, especially along the shores. In order to reduce the danger to a minimum the line was produced across the lake on Sunday, and the camp moved to the west shore.

The cache previously arranged for was found to be about twenty chains to the south of the line, in an excellent position and in good condition.

Peerless lake is a very fine sheet of water, from three to six miles wide, and from twelve to fifteen long. A small creek, navigable for canoes, connects the southern



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end of the lake with another small lake, on the southern shore of which is situated the Trout Lake trading post. There are no rivers of any size flowing into either of these lakes, and, judging from the appearance of the water and the depth of the larger lake, they are probably fed by large springs. The water was clear and good and not at all like the muskeg drainage, which, with the exception of the water in Peace river, was what we had all along this line. Both this lake and the one to the south are said to teem with fish; bull trout, lake trout, pike, whitefish and sucker are said to be abundant, and the fact that several families make this lake their headquarters would seem to confirm the report.

The country between this lake and the fifth meridian is largely burnt-over muskeg and low ridges, and the soil on the ridges is generally sandy. In a large measure this description applies to this section as far as range 18. Muskeg and windfall were the predominating features. The valley of Loon river in range 9 was, at the time of my visit, one vast muskeg and in many places a shaking bog, but along the west bank, not more than half a mile distant from the river, was found the first good horse feed of the season, on June 3.

The river varies in width from one to one and a half chains, and is from one to three and a half feet in depth, with a current of from two to three miles per hour. The water very markedly indicates its muskeg origin, and I was credibly informed that the muskegs increased in area and softness farther north, and all the country to the south draining to this river is more or less muskeg.

The party lost a week, getting around the muskegs on the west side of Loon river, as it was found necessary to follow an old trail south along the river to Loon lake, and thence along another trail to the west of the muskegs.

I was fortunate in being able to secure some assistance in packing through this country, as the flies at this time were extremely bad, and the help in packing gave our ponies a chance to hold their own.

The shores around Loon lake are largely muskeg and windfall, and are very marshy along the water's edge, but they support a very vigorous growth of marsh grass and reedtop, from which many hundreds of tons of hay could be cut.

The cache on Otter lake was reached on July 6, and the supplies were found to be in fair condition, but in the immediate vicinity of the lake horse feed was very scarce. This cache was found to be about one mile north of the base line and in range 13, in place of range 15 as shown on the maps.

From Otter lake to range 18, the country was all muskeg and ridges covered with very heavy windfall. The extremely dry season was of very material help to the party in getting through this part of the country.

In range 18 the line approaches the valley of Little Cadotte river, where muskegs are not so numerous, and the soil appeared to improve. From range 18 to Peace river are many fine plateaus, although the valleys of creeks flowing into the Peace are, as a general rule, very rough and broken. There are, however, many patches of good grass, reedtop and pea-vine, and a few clumps of large spruce and poplar. In many places to the south of the base line there is heavy windfall. The line followed the Cadotte valley to section 32, range 20, and was so very rough and broken by slides and windfall that the levels were taken along the creek bed, to save both labour and time.

The Peace valley, where it is crossed by the base line, is exceedingly rough and broken, with cut banks, windfall and brush, and there is no grass to speak of. The plateau on the east side of the Peace is a rather fine tract of country and, if accessible, many fine ranches for cattle and horses could be selected, especially in townships 88 and 89, ranges 19 and 20. These townships would be almost ideal locations, as there is sufficient good level land to raise all the hay required, and the broken country is generally very good grazing land, and affords good shelter in rough weather, while the two branches of the Cadotte provide an abundant and permanent supply of good water.



Peace river is from one-half to three-quarters of a mile wide at this point, with several islands along its course. Water was low at the time of my visit, and was falling at the rate of about one foot in three days. The banks on either side are generally gravelly and stony, with many patches of quicksand, and many very large gravel bars and sandbars projecting into the water. The banks at this time of the year averaged from fifteen to eighteen feet above the water.

No minerals of economic value were seen along the river, but some drift coal and many curious fossils, probably of the Carboniferous age, were noticed among the drift that littered the shores. The river has a current of three to four miles per hour and, at the time of my visit, would range in depth from ten to twenty-five feet. There are very few fish, and the water until it begins to freeze up, has a decidedly milky appearance, but is fresh and good to the taste.

Arrangements were made previously to have a boat awaiting our arrival, and our cache was placed at the mouth of Whitemud river. Everything was found to be in order on our arrival.

The transfer of the pack-train was our most serious difficulty, and to reduce to a minimum the chances of losing our ponies, it was decided to take them across one at a time, and after a strenuous day, they were all landed without accident.

The side of the valley to the west was covered with a fair growth of birch and poplar with a few large spruce up to eighteen inches in diameter. Within a quarter of a mile of the top we again ran into muskeg which, however, did not extend far, ending in range 21. The country along the base line in the west side of range 21, through range 22 and south of the line in ranges 23 and 24 is a very fine tract of land, rather open and dry, generally covered with good grass and having sufficient timber for fences, buildings and fuel. This tract extends south practically to Peace river. Range 25 is largely muskeg which extends to the foot of Clear hills, where the sixth meridian was reached, and the twelve miles north along the meridian were largely muskeg and windfall, the few open patches along the creeks being exceptions.

While camped in range 23, the party were forced to retire on account of forest fires, which had apparently been raging for some time, as the air had been filled with smoke for several weeks. On the evening of September 28 the explorer returned and reported that the country to the south was all on fire, and that the fire was within one and a half miles of the camp, and was coming in our direction. At day-break the following morning we pushed our way to the south over the burning and burnt lands to safety. O few of the horses were scorched a little and the whole party was thoroughly smoked, but otherwise we suffered no harm. Rain fell two days afterwards and the fires, although not entirely extinguished, were checked so that we were able to proceed with the line. Through the burnt country, work on the line and trail was reduced to a minimum, as in many cases windfall and brush were cleared off in a most thorough manner.

The twenty-third base line was completed to the sixth meridian on October 11, and we had the good fortune to meet Mr. J. R. Akins, D.L.S., who was surveying the base line from the west.

The sixth meridian was produced north twelve miles by October 26, but provisions were running low, and the horse feed was very scarce and poor, the summer frosts apparently having injured it before maturity, and as winter was apparently coming on, it was decided to close work for the season. Before leaving, a good cache was erected one-half mile west of the end of the line, and a sleigh road was cut to connect with the road from Bear lake to Peace River Crossing.

The party started for Edmonton on October 25. Small lakes and streams were covered with ice that would carry a man at this time, but ice was still running in the Peace on November 1 when we reached that place. It was therefore found necessary to arrange for wintering the pack-train on the west side of the river, and, accordingly, Mr. Sutter was engaged to take it to the valley of Whitemud river, as this locality had not been burnt over, and grass was both abundant and good.



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In all, one hundred and sixty-two miles of line, twelve of which were on the sixth meridian, were surveyed between April 8 and October 23.

Observations for azimuth were taken along the line on all possible occasions; and some two hundred were secured throughout the season. During the months of June and July a hazy sky rendered observing most difficult, as even after sunset the Pole star was most difficult to find.

Throughout the season, rabbits, partridges, spruce hens, willow grouse and prairie-chickens were seen in large numbers. Bears were noticed all along the line, and moose were fairly numerous, and along the valleys of Peace and Cadotte rivers, red deer were noticed. Waterfowl were quite numerous on all the small lakes and streams.

The climate in this locality is very similar to that of the country farther south. The summer was very dry and hot, and flies were very bad indeed. Summer frosts were prevalent, doubtless owing to the large tracts of muskeg to be found everywhere along the line, but the country along the Peace, and more particularly along its west side, would be very good for mixed farming; horses and cattle, it is thought, would do especially well.



## APPENDIX No. 29.

## ABSTRACT FROM THE REPORT OF G. H. HERRIOT, D.L.S.

## SURVEY OF PART OF THE PRINCIPAL MERIDIAN.

I left Ottawa on April 28, 1912, and proceeded to Edmonton, where I spent several days in conference with Mr. A. W. Ponton, D.L.S., from whom I received much valuable information with regard to the production of the principal meridian. I then returned to Winnipeg and proceeded to organize my party.

On June 4, with a party of sixteen men, I left Selkirk on the Northern Fish company's steamer *Wolverine*, and reached Warren's landing on the 6th. There we transferred to the Hudson's Bay company's boat *The Highlander*, and proceeded down Nelson river to Norway House. On June 8, after hiring two Indian guides, we left for the scene of our season's work. As our canoes were heavily loaded, and most of the men without experience in canoes, and as Little Playgreen lake was very rough, I was compelled to hire the Hudson's Bay company's launch to tow us across the lake. On the 10th we camped on the east side of Nelson river at a point from which we intended to go into the northeast corner of township 60, range 1, west of the principal meridian. The following morning we made up our packs, and, guided by the two Indians, we set off. That was a terrible day for the inexperienced men, but after travelling about seven or eight miles we finally reached the starting point for our season's work.

I had ordered my supplies as early as possible from the Hudson's Bay company at Winnipeg, giving instructions to ship them by the first trip of the steamer *Wolverine* to Norway House. These goods went up on the same boat as my party, so that no delay was caused by waiting for them. They were all moved by my own canoes from Norway House down to the camp on Nelson river. When leaving Winnipeg I left orders for a second shipment of nearly five tons of supplies to be sent to Cross Lake post. These were shipped to Warren's landing by the Northern Navigation company's steamer, there transferred to the Hudson's Bay Company' boat, and taken down across Big Playgreen lake to Whiskeyjack portage. They were there unloaded from the steamer to a white boat, rowed to shore, loaded on a wagon, and hauled across the portage, a distance of about six miles, where they were again unloaded and placed on a York boat and rowed to the Cross Lake post, a distance of about twelve miles. Here they were again unloaded and carried up to a store tent. From this tent my canoe men from time to time drew their supplies, and so long as the work was in the vicinity of Cross lake this was a simple matter, but when the canoes had to go around to Sipiwesk lake it was necessary to send practically all the canoe men with four loaded canoes around from the post.

On June 12 the production of the line was commenced, after first correcting the position of the northeast corner of township 60, and from this time on the work was continued with as little delay as possible. On June 19, Nelson river was reached and, within the next six miles of line, nine channels of the river were crossed. On August 2 the line reached Cross lake where, after a series of triangulations across various arms and bays of this lake, we finally reached the north shore on August 10. A wide strip of country was next crossed, with no waterways until, on September 3, Sipiwesk lake was reached. In this lake we also encountered innumerable bays, channels and islands, necessitating the measurement of many triangles. On the



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24th, the north shore of this lake was reached, and the line was produced about five miles farther by the 30th.

On October 1 we broke camp and started back to Warren's landing, arriving there on the 10th, and sailing from there on the steamship *Wolverine* the following day. We arrived in Selkirk on the 13th, and the following day I paid the men off.

## METHOD OF CARRYING ON THE WORK.

The work of producing the line and of taking the necessary observations was carried on by myself, while to the two assistants and the chinamen was left the work of chaining, check chaining, levelling and check levelling. The first assistant, with one of the chainers, did the chaining and check levelling, while the second assistant did the levelling and check chaining. The work of bringing supplies down the river from Norway House was left to the head packer. He, together with five men, also had charge of the work of moving camp, but in order to assist him as much as possible, on moving days every man packed his own bed and clothing, together with the sleeping tents, to the end of the cutting or possibly right through to the new location for camp. The packers would bring up part of the cook's outfit and pitch camp, then return for another load. In order to keep the supplies up with the work the packers would take a load or two ahead the day before we expected to move, then the day after moving they would probably have the remainder to bring up to camp, as well as a load to move on ahead. In this way six or seven men were able to keep sufficient supplies in camp. The rivers and creeks were utilized as much as possible, and the supplies moved along them in canoes to the nearest point to the work, and from there packed into the camp. Whenever a wide stretch of country was crossed without watercourses that could be followed, it was necessary to send the packers, who were all good canoemen, around with supplies to a point where we expected the meridian to strike the next waterway, and not infrequently the packers would be away for two or three days; in one case they were away for five days. During these periods if camp had to be moved, everyone had to make a second trip and so no cutting was done on the line.

## NELSON RIVER.

The whole area covered by our season's work is drained by Nelson river, and the various creeks and streams that are tributary to it. This river carries the overflow waters from lake Winnipeg and the immense territory that pours its waters into that lake. Where all the water is confined to one channel it is nearly a quarter of a mile wide, but this seldom occurs as the river is noted for its intricate maze of channels. Its water divide from Great Playgreen lake, part taking the East and part taking the West channel. Each one of these channels has its different widenings forming lakes, or its branchings forming a net work of channels, but they finally converge to pour their combined waters into Cross lake, a very picturesque lake with innumerable bays and islands. The waters from this lake find their way northward through a continuation of Nelson river, and after a devious course at length empty into Sipiwesk lake, the most beautiful of all these northern lakes. Although the Indian name 'Sipiwesk' implies a lake with many hay marshes along its shore, these marshes do not in any way detract from the natural beauty of such a body of water. This lake is much like Cross lake with its many islands and deep bays and channels, except that the channels are much narrower, and therefore show a much more marked current. One interpreter informed me that Sipiwesk meant a lake of rivers or channels. This interpretation is very applicable.

As already stated, the Nelson is a river of many channels, carrying an immense volume of water, its total discharge being almost as great as that of the St. Lawrence.



Between the point at which the meridian first crosses the river and Sipiwesk lake there is a total fall of 104 feet. Part of this great fall is distributed along the various reaches of the river. The remainder is accounted for by the many small rapids and several larger falls. In travelling from Norway House, Sea River fall is first met, with a clear fall of about 5 feet, then Sugar fall is reached where the fall is nearly 6 feet. Three other smaller rapids are met between there and Cross lake. Between Cross and Sipiwesk lakes the falls in the order in which they occur, and their heights are as follows:—

Ebb and Flow rapids.. . . .	11 feet.
Whitemud fall.. . . .	20 feet in fall and 10 feet in swift water below.
Bladder rapids.. . . .	10.6 feet.
Over-the-hill rapids.. . . .	9.5 feet.
Redrock rapids.. . . .	10.5 feet.
Chain-of-rocks rapids.. . . .	1.2 feet.

When one takes into consideration the enormous volume of water flowing over these rapids and falls it is not hard to realize the possibilities of this river for power production but, on the other hand, the number of these rapids and the falls, together with the fact that the fall between Norway House and Hudson Bay is approximately seven hundred feet, leads one to conclude that navigation of the river is not feasible for boats of large capacity.

Since the early years of the fur-traders, Nelson river has been used as a channel of entry to the interior of the country, and for years York boats have been taken up and down the river. Some of the rapids are run, while others must be passed by portaging. To the Indians in the York boat such rapids as the Sea fall and Sugar fall are points of welcome excitement when going down stream. They row wildly to the edge of the fall and then lie back as their frail craft plunges into the troubled waters below. It is, however, with a very different feeling that they near it when rowing up stream, for they know that in this case it means the arduous task of portaging.

#### CHARACTER OF THE COUNTRY.

The country through which the meridian passes is sufficiently uniform for a few general statements describing its character. The surface is usually nearly level or undulating, being made up of a regular succession of swamps, muskegs, and low rocky ridges. The swamps are largely spruce and tamarack, with water standing from three to twelve inches deep, and covered with a stunted growth of timber. We also encountered frequent moss swamps where little water is found, and where the surface is covered with a thick layer of moss and with spruce and tamarack timber. The rocky ridges are mostly of granite formation and run in a northeasterly and south-westerly direction. They rise gradually to a height of ten or fifteen feet above the level of the surrounding swamps.

The northeast corner of township 60, range 1, west of the principal meridian, lies on the north slope of one of the largest jackpine ridges encountered in that country. The soil is a light gravelly sand, supporting nothing but a growth of jackpine, averaging from three to seven inches in diameter. As one works northward a large tamarack swamp is met. The trees here are very much stunted and of no practical use. To the east of the line the generally level surface of the country is broken by many ridges of outcropping rock, which in some cases rise thirty to fifty feet above the surrounding level. On the west, however, the swamp stretches away off toward the river. As one nears the northeast corner of township 61, the land becomes more undulating, falling gently towards Nelson river. It is broken by frequent outcrops of rock. On these rocky outcrops small jackpine grow wherever any soil is found; this soil is generally moss-covered black muck. Near the northern limit of the township the first crossing of the East channel of Nelson river is made.



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Township 62 is very much broken by channels of Nelson river, as the river there has many large islands, most of them being covered with dense wood. Poplar and spruce form a fringe about the edge of the islands, while the interior is not so heavily timbered. Frequently, muskeg is encountered even on these islands. The soil, however, is much more suitable for agriculture, being in many places clay covered with a vegetable mould. In section 36 of this township the Nelson is crossed for the last time as it flows westerly.

Farther north in township 63 the swamps seem to become narrower and the recurrence of swamps and jackpine ridges become more frequent. The rocky out-croppings almost entirely disappear, although the rock comes to within a few inches of the surface on the summit of each jackpine ridge. The surface soils vary from a deep black muck in the swamps to a yellow clay on the ridges. This clay area would seem to indicate that this belt is really an extension of the great clay belt of northern Ontario. At the northeast corner of the township the line crosses a shallow, irregular lake about three miles long and two miles wide. Its waters overflow through a shallow meandering creek about a chain and a half wide, which, after a winding course of about two miles, finds its way into a branch of the Nelson not far from where that river expands into Pipestone lake. The latter is a rock-bordered lake, about five or six miles long and of nearly the same breadth.

The surface of township 64 is much more irregular, the southern portion being broken by high rocky ridges and intervening valleys. The northern portion, while less rolling, is still broken by the recurrence of rocky out-croppings and swamps. The soil is clay on the slopes of the ridges and black muck, covered by moss, in the swamps. Two small lakes occur close to the line and a third is crossed in section 36.

Throughout township 65 the surface of the country becomes more undulating and the swamps do not seem to be of so great extent. Even their character seems to change, and the tamarack swamps with much standing water seem to give place to the drier moss swamps covered with spruce, and broken more frequently by jackpine ridges. The soil, too, is of a better quality, clay loam being found in many parts. In section 36, Cross lake is reached. This lake is a long irregular body of fresh water surrounded by a rocky shore line. It is about six miles wide and probably fifty miles long, and is dotted with innumerable islands, many of which are very large. They are usually rock bordered and covered with a dense growth of jackpine and spruce, some trees reaching a diameter of sixteen inches. The lake abounds in whitefish, and is essentially an Indian paradise, with lots of wood and plenty of fish.

About fourteen miles southwest of the northeast corner of the township, and located on the shore of Cross lake, is the Hudson's Bay Co's trading post known as Cross Lake post. On the east side of the channel the Hudson's Bay Co., have erected three log buildings. One of these serves as a storehouse, the second as a store, and the third as a residence. In addition, two other traders have established trading posts at this point. North of the Hudson's Bay Co's store, Mr. Hire has established a post, and south of it along the lake, Mr. Mercer trades and barter for the Indians' furs. The best of relations exist between these rival trading houses. The welfare of the post is zealously cared for by Methodist and Roman Catholic missions, each one having a school in connection with it. On the opposite side of the channel lies a large island which either has been or is to be set aside as an Indian reserve, and here about four or five hundred Indians live during the summer, during which period the men are mostly employed on the Hudson's Bay Co's York boats, while the women spend their days in catching what few whitefish are running, for their own food as well as that of for their sleigh dogs. About the middle of September in each year these families leave for their various hunting grounds, and spend the winter hunting and trapping; and a rich harvest some of them make, for fur-bearing animals are plentiful and up till the present they have been practically unprotected.



The whole of township 66 lies in Cross lake and what land area exists is formed of islands covered with abundant growth of spruce and jackpine.

The meridian strikes the north shore of the lake in section 1 of township 67. This township is mostly low lying and very wet. The soil is largely black muck. Across the northern part of the township, where higher land is encountered and the country has not been so wet, bush fires have swept, so that this area is covered with the standing fire-killed trees.

As we worked northward into township 68 the burned area gave place here and there to tamarack swamps where it was too wet for the fire to run. The soil, too, seems to improve, and more clay is found.

Township 69 is more broken by small lakes than the one previously described. In section 18, east of the meridian, lies White Rabbit lake, a small lake with an outlet to the north leading to Sipiwesk lake. The country is covered largely with fire-killed trees, except where tamarack swamps intervene. The soil varies from a deep black muck to a heavy clay. In the northern part of the township Sipiwesk lake is first encountered. Sipiwesk is like Cross lake in that it is broken by innumerable islands, channels and bays. It is about twelve and a half miles from shore to shore along the meridian, and roughly thirty miles long. Many of its islands are covered with dense spruce, some trees reaching sixteen to eighteen inches in diameter. In some of the narrower channels of the lake the current is quite perceptible. Along a few of the islands large hay marshes occur. Whitefish and sturgeon are plentiful.

Townships 70 and 71 are broken by the many channels of Sipiwesk lake. The islands are largely covered with dense spruce. The soil on them is a deep clay except in the swamps, where black muck appears. In section 36, township 71, the north shore of Sipiwesk lake is reached.

The surface of township 72 is generally undulating, being covered mostly with fire-killed spruce and, in the hollows, tamarack swamps occur.

Throughout the whole of this area which the meridian traverses, fur-bearing animals are very numerous. Beaver, mink, muskrat, marten, red, black and cross foxes, lynx, wolves and otter are trapped in great numbers by the Indians. Moose are very plentiful, and provide the major part of the Indians' winter diet. Small birds are not numerous, but partridges are very plentiful, and wild ducks and geese frequent these waters in summer. Whitefish abound in the waters of all the larger lakes, such as Sipiwesk, Cross, Playgreen and Butterfly lakes, and also in Nelson river. Sturgeon were for years caught in large numbers in Sipiwesk lake, and I believe they are still to be found there in great numbers, although the sturgeon fisheries which were in operation on that lake a few years ago, have since been abandoned.

In conclusion, a brief summary of the various rapids to be passed between Norway House and Sipiwesk lake, with the approximate length of portage required to pass each, might be appended:—



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Name.	How passed.	Description.
Sea River fall.....	Portage.....	About 150 feet long over a rocky island or by a shore route 15 chains long.
Sugar fall.....	Portage.....	On west side about 300 feet long over a rocky shore line.
Three small rapids.....	Portaging or tracking.	Over short islands.
Ebb and Flow rapids.....	Portage.....	About one-quarter of a mile long.
Whitemud fall.....	Portage.....	Nearly half a mile long.
Bladder rapids.....	Portage.....	About one-quarter of a mile long.
Over-the-hill rapids.....	Portage.....	Only about 300 feet long, but over a hill 30 feet high.
Redrock rapids.....	Portage.....	Either: (1) By two short portages and then hauling the canoe over a high rocky hill, 30 feet or 40 feet high, or else letting it down by a line after lightening it; (2) portage about three-quarters of a mile long, with a hill 40 feet high at the north.
Chain-of-rocks rapids.....	Portaging or tracking.	A short portage.

From the foregoing list of portages it is quite apparent that the work of transporting supplies in summer from Cross Lake post is quite a difficult one.

The winter transportation is even more serious still, for during the winter months dogs are the only means of transport or travel, and unless one has a base of supply fairly close at hand, this is a very expensive means. Moreover, dogs are hard to obtain and very expensive to buy, the price ranging from \$25 to \$30 each.



## APPENDIX No. 30.

## ABSTRACT OF THE REPORT OF A. LIGTHALL, D.L.S.

## SURVEYS IN THE NEW WESTMINSTER DISTRICT OF THE RAILWAY BELT, BRITISH COLUMBIA.

I received your instructions dated May 1, 1912, at Vancouver, and, in accordance therewith, I immediately organized my party and proceeded to Woodhaven, where my first survey work was located. The place is about eight miles from Vancouver, situated on the north arm of Burrard inlet and easily reached by steamers which make daily trips up the North arm. It is being laid out as a townsite, and is intended as a summer resort. The land is comparatively level and is covered with heavy bush, though most of the valuable timber has already been removed. Numerous skid roads have been built during the logging operations and, being still in a state of good repair, will probably be used as streets for some time. Part of this townsite lying close to the shore has already been disposed to private parties, and about a dozen houses have been built and are occupied during the summer months by their owners.

I next moved my party to Hope by railway and thence by pack train up Silver river to survey timber berth No. 554. There is a very good pack trail up this river, but pack horses are a little difficult to obtain just when they are needed, making transportation uncertain and expensive. The river is fairly large, being about one hundred feet wide and two or three feet deep near its mouth. The current, however, is very swift and the river is entirely unnavigable. It provides good fishing as it contains numerous fine, large trout. The river flows through a valley which varies from one-quarter to one mile in width. The bottom of the valley is very heavily timbered with cedar, fir and hemlock, some of the cedar reaching a diameter of thirteen feet. The hills on either side are very steep, and the timber thins out rapidly as one ascends. These hills rise to a height of five to six thousand feet, and some of them are covered with snow the whole year. No fires have ever run through this valley, and the land appears to be fairly fertile and will, no doubt, make excellent agricultural land when the timber has been cleared off. The Provincial Government is now building a fine automobile road up the valley, which will eventually connect Hope with Princeton, and afford future settlers an excellent means of communication with the outside world. At present the only inhabitants of this valley are a few trappers who catch bears, muskrats and marten.

I completed the survey of four blocks of this timber berth and also traversed the right bank of the river across section 5, township 5, range 26, west of the sixth meridian, and thence moved back to the north arm of Burrard inlet, to the survey of timber berth No. 555, which is situated in township 6, range 7, west of the seventh meridian. Several timber berths had already been laid out in this locality, but on retracing some of the lines I found that the old surveys were very much in error, and consequently I had to lay out timber berth No. 555 considerably larger than my instructions called for. This group of timber berths is laid out along the valley of Grand creek a stream about thirty feet wide and one foot deep at its mouth. In the last half mile of its course it descends about eight hundred feet and water-power has been developed on it to run a quarrying plant on the shores of the inlet. Above the falls is a basin of considerable extent where logging operations are now being carried on in timber berth No. 270. The land here will never be of much use for agricultural purposes after the timber has been taken off, as it is very rough. Around this basin the hills rise steeply to a height of about four thousand feet, the timber growing up to about three thousand feet, and the tops of the hills being quite bare.



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After finishing timber berth No. 555, I moved to Pitt lake to the survey of timber berth No. 557. This lies on the west shore and about two miles from the head of the lake and, like most of the country around Pitt lake, is very rough and mountainous. The hillsides are covered with a fair growth of timber, but I should judge that the logging would be a rather difficult operation on account of the steepness of the hills. DeBeek creek enters the lake just to the north of this berth. This stream is about fifty feet wide and two feet deep, and as it has a good fall considerable water-power could be developed. Game is plentiful in all these mountains, but is very hard to get on account of the dense undergrowth. The creeks contain a considerable quantity of fine trout.

From Pitt lake I went to Sumas prairie in township 19, east of the coast meridian. The survey here consisted of the traverse of Anderson creek and Sumas river across lot 224, group 2. The country is perfectly flat and is covered with grass. It makes excellent grazing land but is subject to overflow from Sumas lake when the water is high, and is not used for agriculture to any great extent. It is well settled, the farmers going in for cattle raising on a limited scale. When it is dyked it will no doubt develop into a fine agricultural district.

From Sumas prairie I went by boat down Sumas and Fraser rivers to Langley townsite. This was originally intended for the capital of the province and contained a court-house, jail, and several other public buildings, but when the capital was moved to New Westminster, the town was abandoned, and very few traces of the old buildings are left. The land is mostly wooded and is comparatively flat, and the lower portions are subject to overflow from the Fraser, but can be reclaimed by dyking, and made into good agricultural land. There is a peat marsh, however, in the northwest corner of the townsite covering about one hundred and fifty acres which will never be any use for agricultural purposes, the moss and peat going down to a great depth. Five of the original settlers are still on the land and the townsite was divided into six lots of about one hundred and forty acres each, one lot going to each settler; the sixth, being laid out in the peat marsh, was not claimed by anyone. The shore along the northeast corner of the townsite is being rapidly cut away by the river; in some places it has encroached over two hundred feet on the land in the last twenty years. The settlers are engaged in farming in a small way, and also depend for their living on catching salmon in the river. Grouse and pheasants are plentiful in these parts.

From Langley townsite I went to Ruby creek by railway. There I laid out fractional sections 30 and 31, in township 4, range 27, west of the sixth meridian, on the north bank of Fraser river. The land is well covered with timber, and parts of it, being fairly level, are well adapted for agricultural purposes. The best land, however, is taken up by Indian reserves, and as the Indians pay more attention to fishing than to agriculture, not much progress has been made on it. The climate appears to be a little drier and colder than it is nearer the coast, and high winds prevail, due no doubt to the narrowing of the Fraser valley.

From Ruby creek I returned to Hope, and from there went up Silver river where I laid out the remaining two blocks of timber berth No. 554. I reached there on November 18 and found that the season was becoming rather advanced for mountain work, the pack trail being considerably more difficult to travel over than on the previous trip. We were fortunate, however, in having a couple of weeks of fine weather and had just finished the survey of the two blocks when a heavy snowstorm came on which put a stop to further survey work in this district. I returned to Hope and thence went by rail to Agassiz; from there I went by wagon to section 16, township 4, range 28, west of the sixth meridian. There I laid out the southwest quarter of the section for a settler named McLean who had been living on it for six or seven years. About fifty acres of this quarter is good flat land, the rest of it lying on a hillside is of no use for agricultural purposes. A considerable amount of flat land adjoins this quarter on the east and is occupied by a very prosperous looking farming community.



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On completing this survey, I paid off most of my party and took the remainder down to Westminster Junction and from there up Pitt river to township 41, east of the coast meridian. There I corrected the positions of the posts on the east boundary of section 12, and also on the east boundaries of the northwest and southwest quarters of section 12. This work was done in a heavy rainstorm, which made the trip very unpleasant.

That completed all the surveys for which I had instructions, with the exception of a small survey near Stave lake, and as I considered that this survey could be done more advantageously at the beginning of the next season, I returned to Vancouver, paid off the remainder of my party and closed operations for the season.





Looking up Athabaska River, Jasper Park.

Photo by E. Deville, D.T.S.



Fiddle Creek below the Canyon, looking towards Athabaska River.

Photo by H. Matheson, D.L.S.







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## APPENDIX No. 31.

## REPORT OF G. J. LONERGAN, D.L.S.

INSPECTION OF CONTRACT SURVEYS IN ALBERTA AND WESTERN SASKATCHEWAN.

BUCKINGHAM, QUE., February 15, 1913.

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa, Canada.

SIR,—I have the honour to submit the following report on my survey operations of last season:—

My first work was a correction survey in townships 63 and 64, ranges 3 to 10, west of the fourth meridian. The best way to reach these townships is to follow the Cold Lake trail from St. Paul de Metis as far as the west side of Chicken hill, and from that place there is a faint trail leading north, known as the Mosquito Lake trail; it crosses Beaver river in section 5, township 63, range 8, west of the fourth meridian, and continues straight north about six miles, where it crosses the survey contractor's trail along the north boundary of township 63. The latter trail goes east to Cold lake and west to lac LaBiche trail. These townships are heavily timbered, except townships 63, ranges 5 and 6; on these there are many fairly open sections. The soil is generally a clay loam, and in a few places there are large hay marshes. There is no doubt that ranching would be the most profitable occupation for a new settler. The St. Paul settlement does not extend farther north than Beaver river. There are prospects that a railway will soon cross this district, as the Canadian Northern Railway company has already started a road north from Edmonton; last November they had 69 miles graded.

Having completed the work I returned to Edmonton and, after purchasing more supplies, I drove to Athabaska Landing, then west about forty miles to inspect two contracts. There is a good trail from Athabaska Landing as far as Baptiste lake, and from there the only trail is the one made by the contractor. Township 64, range 26 has been burnt over almost clear of everything. The land is dry and the soil a clay loam, but in township 63 of the same range it is chiefly tamarack swamp. Townships 65 and 66 ranges 26 and 27 are dry rolling country, having a clay loam soil, covered with poplar and scattered spruce from six to eight inches in diameter. When the timber is cleared from these townships they will make good farm land. I might add that the railway leading to the Peace river country, and which is now partly constructed, will pass through these townships.

Having completed the inspection of these two contracts I went to Red Deer to subdivide a township that was previously covered by Cygnet lake. On my arrival I found that the contractor who was draining the lake had met with difficulties, and had not completed his work. I was accordingly obliged to postpone the survey for the time and started to repost township 53, range 25, west of the third meridian. Saskatchewan river cuts through the southwest part of this township, and for about a mile on either side of it the land is so cut up by ravines, and is so rolling that it is fit for nothing but pasture land. The remainder of the township is fairly level, having a sandy loam surface and a clay subsoil. A number of settlers have started farming and they appear satisfied with their choice of location.

Leaving there about the end of August, I started for Heart lake, which is north-east of lac LaBiche, to inspect Mr. Davies' contract. At St. Paul I was advised to



go by way of lake St. Vincent, thence to the forks of the big and small Beaver rivers and follow up the shore of the little Beaver until I would strike the lac La Biche trail. In my opinion it would be best to go by some other route, even if the distance was greater. From the east end of lac La Biche there is a trail that leads to Heart Lake; it goes up and down all the high hills, and a good team can haul only about 1,000 pounds on it.

This contract, comprising townships 69 and 70, ranges 10, 11 and 12, west of the fourth meridian, is high rolling country, covered with poplar and scattered spruce, six to eight inches in diameter. There are a few large tamarack swamps to be found, and many large lakes, most of which are well stocked with fish. A few families of Indians live around Heart lake and exist entirely upon fishing and hunting, no attempt having been made at cultivation, although the soil appears to be as good as elsewhere. Leaving here on September 10, I went to inspect Mr. Green's contract, comprising townships 41, 42, 43 and 44, range 7, west of the fifth meridian. I went west from Red Deer on the Rocky Mountain House trail as far as Leslieville, and from there northwest along the south bank of Lobstick creek. This trail ends in section 35, township 40, range 6. It being impossible to continue with wagons, I packed a tent, a few blankets and provisions and started cutting a pack trail, doing inspection and moving at the same time. The country is rolling and thickly timbered with large spruce and poplar, and the soil is a clay loam. The best of the spruce is already taken up in the form of timber berths, and there is a saw-mill in operation on Lobstick creek, which will do custom sawing for the settlers at reasonable rates. I might remark that it is impossible to reach these townships during summer by going west from Wetaskiwin to Buck lake. On my way in I was agreeably surprised to find such a large tract of fertile land. It was thickly settled from Red Deer west, and the farmers had a prosperous appearance. I counted seventeen threshing outfits in operation. Leaving Mr. Green's contract I went to inspect Mr. Ord's, in townships 61, 62, 63, 64 and 65, range 18, west of the fourth meridian. From Pakan to Smoky Lake post-office there is a good road, and from there a surveyor's road going north in range 17 to Buck lake and then to lac La Biche. In township 61, range 17, there is a branch trail leading into range 18, and thence northerly. Townships 61, 62 and 63, range 18, were overrun by fire a few years ago and are now either entirely cleared or covered by windfall. The soil is a clay loam, and the surface very rolling. There are a few Galician families settled on the south part of township 61, but the most of the country is still open for entry. The northern two townships are heavily timbered with poplar and scattered spruce, six to eight inches in diameter. The large number of small lakes and swamps has protected them from fire.

It might be of interest to prospective settlers to know that from Pakan, north, east and west, the country is settled almost entirely by Galicians, and judging from the appearance of the buildings and stock they are in a prosperous condition. They still retain the language and customs of the old country.

My next work was in townships 63 and 64, ranges 3, 4, 5 and 6, west of the fifth meridian, but as all roads start from Edmonton and radiate in different directions it was necessary to once more return to the capital; from there I followed the Lesser Slave lake trail to reach my destination. It was fortunate that the ground was now frozen over, for from Belvedere to Holmes crossing, during wet weather, is to be found one of the worst trails in Alberta. There is some very good land in these townships, but generally for a few miles back from the river it is chiefly sand hills, covered with jackpine, and between the hills are to be found tamarack swamps. I met no settlers located in the townships in this contract, but came in contact with an engineering party locating a railroad to strike the east end of Lesser Slave lake at Sawridge. In conversation with the engineer in charge, who had been over the country as far as the lake, he said the railway would pass through a lot of very good farm land. In November the location was passing through range 5. Throughout the contract there



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were found along the creeks many large open places covered with a luxuriant growth of grass. If settlement would not rush in too quickly it would certainly prove to be a good ranch country. Holmes crossing is quite a busy place, it being the headquarters for settlement extending northwest along Freeman river from the Assiniboine flats.

After completing this work I returned to Edmonton and disposed of my transport outfit and reduced the number of my party. I then went by train to Medicine Lodge, where I engaged a team to move camp and supplies. I drove about eighteen miles north of the railroad on the trail that had been recently opened out to go to Grande Prairie and the Peace River district. As far as I could see, the country is a succession of rolling sand hills covered with small jackpine or scrub spruce, and up to the present no attempt has been made at farming. I completed the inspection of this work and then returned to Edmonton, where I paid off the remainder of my party and took the train for the East.

I have the honour to be, Sir,

Your obedient servant,

G. J. LONERGAN, D.L.S.



## APPENDIX No. 32.

## REPORT OF E. S. MARTINDALE, D.L.S.

## SURVEYS IN SOUTHERN ALBERTA.

AYLMER, ONT., February 12, 1913.

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa, Canada.

SIR,—I have the honour to submit the following report on my surveys in Southern Alberta during the past season.

I left Aylmer on May 9 and proceeded to Calgary, where I engaged my men and organized the party. The transport outfit which had been wintered at High River was shipped to Medicine Hat, from which place we were to commence retracement surveys. Being somewhat delayed at Medicine Hat by heavy rains and the non-arrival of freight from Calgary, we did not reach township 6, range 2, west of the fourth meridian, the scene of our first work, until May 30. Townships 6, ranges 1 and 2, were then retraced, and having received your instructions for the surveys in the mountains, the retracement work was brought to a close. The outfit was taken to Irvine, a small village on the main line of the Canadian Pacific railway about twenty miles east of Medicine Hat and from there shipped to High River.

Townships 6, ranges 1 and 2, are reached by good wagon trails through partially settled country. This country is not very productive and varies from gently-rolling to broken and hilly prairie. The soil is mostly a sandy loam from four to ten inches in depth underlaid by a hard gravelly subsoil, in some places the surface is stony. These townships are but a short distance south of the bench of the Cypress hills, and owing to the high altitude, summer frosts are a frequent occurrence; hence, this locality is unsuitable for agriculture. Almost the whole of these townships is given over to ranching, horses being raised principally. A few homesteads have been taken up in range 2 but, after one or two unsuccessful attempts to raise a crop, several of these have been abandoned. So far there is practically no settlement in range 1.

Owing to the continuous heavy rains during the first part of July we were unable to leave High River for the mountains until July 9 and even then the roads were almost impassable, the mud being axle deep. The fifth base line was produced across range 5 and two miles of range 6 by the end of July. The whole month was very wet, and the work was greatly retarded on this account.

Subdivision surveys were then carried on in townships 17 and 18, range 6, west of the fifth meridian, and Highwood river was traversed across township 17, range 6. These townships lie between the Highwood range and the main range of the Rockies in very hilly broken country. However, it is easy of access by a good wagon road from High River, which has been built and is being maintained through the mountains by the Lineham Lumber company which operates the timber berths up Highwood river.

On the base line across range 5 the timber is scrubby jackpine, spruce and poplar, and is of very little value; the remainder of the Highwood valley has been well timbered with spruce and jackpine up to twenty inches in diameter, but the valley was swept by fire in 1910 and the timber is now fit for fuel only. Coal of good quality is found in these townships, and several large claims have been taken up.



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Highwood river is a swift-flowing mountain stream, from which it would be rather difficult to develop power. Mann creek, or Cataract creek, flowing into the Highwood from the south in section 34, township 16, range 5, is another swift stream with numerous small rapids and waterfalls near the river. There appears to be a fall of over one hundred feet in less than half a mile near the mouth, and power could be developed there at reasonable cost.

Game is not plentiful, although a couple of deer and some mountain sheep were seen during the summer. Partridges were not numerous.

In September the outfit was moved up Storm creek over Storm creek pass into Kananaskis valley in township 20, range 9, west of the fifth meridian. The east boundary of range 9 was run nearly to the fifth correction line, and the subdivision work in township 19, range 8, was completed.

This country is most easily reached by pack trail from Morley on the main line of the Canadian Pacific railway. Kananaskis river has its source in the Kananaskis lakes, and flows in a narrow valley between two mountain ranges into Bow river, west of Morley. The river averages from one to one and a half chains in width and has a depth of from two to ten feet. There is a waterfall about twenty feet in height two miles north of the lakes, where considerable power might be easily developed. Pocatererra creek, commencing near Storm creek pass, empties into the river about twenty chains below the falls. The Kananaskis lakes in township 19, range 9, are two very beautiful bodies of water, the northern one being about three miles in length and from one-half to three-quarters of a mile in width and the other having a little larger area, but being more circular in shape. The valley of the Kananaskis was originally well wooded but having been burned over many years ago it is now mostly covered with a thick mat of windfall and small jackpine. Coal is also found in this valley, large outcrops being visible on the mountain side to the north of Pocatererra creek. Game is very scarce in this district.

On account of the severity of the weather in October, and also owing to the fact that our supplies were getting low, we were forced to leave some of the mounding on this work incomplete. We moved back again to the Highwood valley on the 21st of the month. Heavy snowstorms were then a daily occurrence in the Kananaskis valley and there was already a depth of over two feet of snow on the passes.

The subdivision in township 18, range 7, and townships 17, ranges 5 and 6, was completed by November 18, when it was decided to close operations for the season. Accordingly, the outfit was taken to High River and the party was there disbanded. Arrangements were made for wintering the transport at High River.

Accompanied by my assistant and one chainman I then proceeded to Elkwater lake in township 8, range 3, west of the fourth meridian, to survey the townsite for which you had given me instructions.

This townsite, which is situated in the Cypress Hills forest reserve is easily reached from Medicine Hat by a well-travelled wagon road; it is located at the south-east corner of the lake at the foot of the northerly slope of the Cypress hills. A contour survey had been made earlier in the season by Mr. F. V. Seibert, D.L.S., and a proposed plan, to fit the configuration of the ground, prepared in your office, from his notes. It was found that this plan was quite suitable, and it was followed, with very few changes, in making the survey. This survey being completed, we returned to Medicine Hat on January 21, 1913.

I have the honour to be, Sir,

Your obedient servant,

E. S. MARTINDALE, D.L.S.



## APPENDIX No. 33.

## ABSTRACT OF THE REPORT OF H. MATHESON, D.L.S.

## TOPOGRAPHICAL SURVEYS IN THE FIDDLE CREEK DISTRICT.

On May 20, I arrived in Edmonton and began to outfit for my season's work. On the 27th I left Edmonton by the Grand Trunk Pacific railway for Hinton, that being the farthest point west to which the railway would haul freight or passengers at the time. I left my packer and one assistant in Edmonton to see about loading my horses and supplies on the freight train which left Edmonton the following day. My party consisted of two assistants, a cook, a packer and three labourers.

On the 28th, I hired a team in Hinton to move the part of my outfit which had already arrived to Jasper park, and I established my first camp on the east bank of Fiddle creek, about a mile south of the railroad. The remainder of my outfit and pack horses arrived three days later.

On May 29, I started topographical work south of Fiddle creek canyon. The object of this work was to locate a road up Fiddle creek from Miette Springs station on the Grand Trunk Pacific railway to Miette hot springs, a distance of about eleven miles. I did the topographical work by the transit stadia method, the same as used by Mr. G. H. Herriot in this vicinity in 1911. Traverses were run in the area covered, and from the stations of these traverses stadia readings were taken on all prominent changes in slope. The stadia readings were reduced in the field by means of a slide rule, and a sketch was made on the spot on a scale of 400 feet to an inch, and with ten feet contour intervals. These sketches were afterwards used in making the road location. A line of levels was also run from a bench-mark on the Grand Trunk Pacific railway near Fiddle creek bridge to a point above Fiddle creek canyon.

From my first camp I completed the work around Fiddle creek canyon and north of it. Then I moved my outfit to the mouth of Morris creek, a tributary of Fiddle creek above the canyon.

The work around Fiddle creek canyon was very difficult, because many parts were inaccessible. In these places points were determined by intersections, that is, bearings were taken to the points from two or more stations. Vertical angles were also read to the points and the elevations determined.

From my camp at the mouth of Morris creek, I completed the topographical work, connecting with the work done by Mr. Herriot in 1911. I then proceeded to make a road location. For convenience I started at a point south of Fiddle creek canyon, and worked south towards Sulphur creek. The location follows the mountain side east of Fiddle creek from the canyon to the mouth of Sulphur creek, where it crosses Fiddle creek and follows the east bank of Sulphur creek to the springs. After locating the road to the crossing of Fiddle creek, I moved my camp to the junction of the two main forks of Sulphur creek, about one mile and a half north of the springs, and then, from a point about a quarter of a mile below the springs, I located the road north to the crossing of Fiddle creek and south to the springs.

After completing the road location from Fiddle creek canyon to the hot springs, I moved my camp to the spot where I had my first camp. Then I started at a point east of Fiddle creek canyon and located the road northerly to the Grand Trunk Pacific hotel site. I did not locate the portion between the hotel site and the railway, as this portion is fairly level and offers no difficulties. Just south of Fiddle creek canyon the location passes around a gully with almost perpendicular rock sides.



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Here the road for about half a mile would have to be blasted out of a rock fall. I did not locate this part on the ground as it was inaccessible.

I located the road as an ordinary traverse, but placed stakes every 100 feet, also at prominent changes in slope, and on these marked the chainage from the starting point. I took levels along the traverse to find the elevations of all the points marked by stakes. I also took slope readings with a clinometer across the line of traverse at the different stakes, and took notes of the nature of soil or rock to be excavated. The greater part of the road location is along fairly steep hillsides, where numerous gullies of various size and other obstructions had to be crossed. From my topographical work I knew the points where these could be crossed most easily and the positions and elevations of these points. In making the location the level work followed close to the transit work, so that the elevation of each station occupied was known very closely. In this way I could arrange my grades to cross gullies and other obstructions at the proper elevation. The maximum grade allowed was eight per cent.

A road could be made to the hot springs from Pocahontas. This would be cheaper to construct than the road laid out, although I think that a good road to the springs along any route would be more expensive than is generally supposed. From Pocahontas a road is already constructed about five miles toward the springs. This has been constructed to be used in hauling out timber for the Jasper park collieries. This road could be improved and used as a part of the route to the springs. However, the part between the end of this road and the springs is the difficult part to construct. The present road could be produced to the mouth of Morris creek and thence along Fiddle creek to a good crossing and thence across that creek to my location on the east side, and my location could then be used to the springs. I think this would be the best route, if the road is to start at Pocahontas, because, by following the west side of Fiddle creek, a large number of creeks and gullies would have to be crossed where the hillsides are steep and the nature of the ground is such that landslides and wash-outs would be liable to give trouble. It would, however, necessitate two bridges across Fiddle creek. There is a fall of four or five feet in Fiddle creek, a short distance below the mouth of Morris creek. Here the river bed is narrow, and a bridge could be easily constructed over the falls. Or probably some more suitable crossing could be found between Morris and Villeneuve creeks.

The route above described would not include the scenery around Fiddle creek canyon, but a branch road could be built from some point on this road to the canyon. This route could, however, be made to include the "Punch Bowl" falls, a short distance from Pocahontas, and probably a very pretty falls, 25 or 30 feet high on Morris creek, about a mile above its mouth. This route would undoubtedly be cheaper than the route I laid out by Fiddle Creek canyon. But, if constructed, the hotel site would have to be changed and some point in the vicinity of Pocahontas chosen. There are two reasons for this. In the first place the distance from the present site to the springs by that route would be too great, and in the second place, if the present site were used, Fiddle creek would have to be crossed to go to Pocahontas, and to bridge Fiddle creek below the canyon would be impracticable. The bed is too wide, and at flood times the creek spreads over the whole bed.

The part of the road already constructed from Pocahontas climbs to the top of a divide. From there it would have to be run down again through an elevation of over 400 feet to cross Fiddle creek, and of course this elevation would have to be climbed again. Almost all such extra climbing would be avoided on the route by the canyon. The route from Pocahontas would also be longer than the canyon route.

By whichever route the road is constructed, there will be considerable clearing to do on the right of way, as almost the whole country is covered with *brulé*. In many cases this *brulé* is intergrown with small jackpine, and trees over eighteen inches in diameter are quite frequent.



I may say that the contour work which I did was done with a view to locating a road from the present proposed hotel site to the springs so as to include the scenery around Fiddle creek canyon on the route. I had no time for any other. However, some of this and some of the work done by Mr. Herriot in 1911 would be useful in investigating other routes.

I consider that the canyon route, along which I made my location, would give the best road, both for roadbed and scenery, also for grades. But I think a cheaper road can be built from Pocahontas. From my plan and profile and accompanying notes, an estimate can be made by an engineer as to the cost of construction by the canyon route.

I completed the location of the road on September 28. I then moved my outfit by wagon and pack horses to Hinton, and took train to Thornton where I was instructed to make some subdivision surveys near the headwaters of Wolf creek, to tie in a location line of the Canadian Northern railway.

At Thornton I hired pack horses to supplement my own pack outfit and, on October 5, I left there, following a trail which runs along Wolf creek up to its source and thence southerly towards the Pembina and Brazeau rivers. The trail also follows close to the Canadian Northern railway location lines. Although generally good, this trail passes through some bad muskegs, which gave me considerable difficulty on my first trip from Thornton, and the horses were mired many times. After the first two trips over the trail, the weather became cold enough to freeze the muskegs.

I established my first camp in township 50, range 18. This was not within the area to be surveyed, but some of the lines to be surveyed were accessible from this camp and I decided to start work from there, because I arrived late at night, and I did not think I had enough supplies to spend another day on the trail. The following day I sent the packers back for more supplies.

My last camp on this work was near the place where Wolf creek crosses the thirteenth base line. From this camp a return trip to Thornton by pack horses occupied about eleven days. As practically all the horse feed had to be hauled from Thornton, I found it almost impossible to keep up supplies by pack train, so I decided to use flat sleighs. I started using three sleighs about the middle of December, traveling on the ice on Wolf creek as much as possible. I found that I could haul more on three sleighs than my eight horses could pack, and also found flat sleighs a very satisfactory means of transportation, especially when they can be used on the ice on lakes or rivers.

The country surveyed consists mostly of ridges with shallow muskeg between them. The land on the ridges is more or less sandy, often sandy loam. Some ridges are very sandy and grow no timber but jackpine. The subsoil in the muskegs is, of course, similar to the ridges. Many of the muskegs could be easily drained and would make the best of land. The timber found consists of spruce, jackpine, tamarack, some poplar, balm of Gilead and willow. There is very little timber of commercial value, because in the past forest fires have been too frequent to permit of a large growth. Both ridges and muskegs are timbered.

Very little game was seen, except grouse and rabbits, although moose tracks were seen. The rabbits were very numerous, and it was common to see hundreds of them around camp at night. They were very destructive, and would even eat tripods and axe-handles. I do not think that fur-bearing animals were numerous, as no trappers were operating in the area surveyed, except a few Indians, who spent only a few days and passed on. Trappers operating in the vicinity find lynx to be the most profitable fur-bearing animal in the district. Weasel are also found and trapped, and there are also muskrats in the lakes and streams.

I made surveys in township 50, range 17, and townships 48 and 49, ranges 16 and 17, west of the fifth meridian, but I was not able to complete all the work for which I had instructions. On December 28 my packers arrived in camp on their first trip with flat sleighs, with a load of supplies. They were delayed on the road from Thornton



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because they had to cut out much timber which had fallen across Wolf creek since flat sleighs were last used on it. In the mail which I received there was a telegram ordering me to close operations at once. As my packers had just brought in a load of supplies, I could not take back this load and all my camp outfit at once, so I sent out half of my party and left the remainder to complete the mounding. After the first half of the party arrived in Thornton, I disbanded the men, and sent the packers back for the rest of the outfit. The remainder of the party arrived in Thornton on January 28, 1913, and I disbanded them, retaining only the packers to take the horses to Ray, Alta., where they were wintered with Mr. A. McDonnell. On February 6 I left Edmonton for the East.



## APPENDIX No. 34.

## ABSTRACT OF THE REPORT OF P. MELHUISE, D.L.S.

## SUBDIVISION SURVEYS IN THE KAMLOOPS DISTRICT OF THE RAILWAY BELT, BRITISH COLUMBIA.

After receiving my instructions, I left Vancouver on May 11, 1912, for Spuzzum, to make surveys in township 8, range 26, west of the sixth meridian, and to survey timber berth No. 552. The first camp was made in section 36, near Spuzzum station, which is on the main line of the Canadian Pacific railway, about 114 miles east of Vancouver. As the old Yale and Cariboo road is entirely obliterated in a great many places along the Fraser canyon, the railway is the only means by which the northerly half of this township can be reached. This road has, however, been repaired in places to a certain extent by the Canadian Northern railway contractors and it is possible to travel by wagon from Yale to a siding known as Saddle Rock, in the southern part of the township. All the agricultural land is included in Spuzzum Indian reserve No. 1 and a few small flats outside the reserve hardly large enough in area to be considered profitable. These small flats are adjacent to the Canadian Pacific railway line and the rest of the land in the township lies on steep mountain sides, timbered with fir and jackpine, and entirely unsuitable for agriculture. No minerals of economic value were found in the township.

The next camp was made in lot 4, near the mouth of Spuzzum creek. This creek is the only one of any considerable size in the township. It flows in an easterly direction and empties into Fraser river in section 24. While working from this camp a trail was made up the left bank of Spuzzum creek. An old trail was found, but it was necessary to cut parts of this out again and to do some mattock work on the steep side-hills. After finishing the subdivision work, camp was moved up the creek in order to continue the survey of timber berth No. 552. This berth is situated in townships 8, ranges 26 and 27, and township 9, range 27, west of the sixth meridian, and lies on each side of the valley of Spuzzum creek. The berth was surveyed to include all the available timber of value not already taken up, for a distance of about eleven and a half miles from the mouth of Spuzzum creek up the north fork, and about nine miles from the mouth of the creek up the south fork. The area of the timber berth is about 4,470 acres. Spuzzum creek is a swift mountain stream with an average depth of about three feet and a width varying from half a chain to a chain. The bed is very rough and is composed of large granitic boulders. The mountains slope towards the creek at a very steep angle on each side, and for a distance of about three-quarters of a mile from where the Canadian Pacific railway crosses, the water runs through numerous small canyons. The elevation of the main forks, which are about six and a half miles from the mouth of the creek, is 1,200 feet above the Fraser. The highest falls, however, are only about twelve feet, and there is hardly sufficient water during the dry period to warrant the construction of a dam.

The old trail which we found followed the general direction of the creek from the railway line as far as the main forks. A new trail was cut out from the main forks to the second forks, on the north branch of Spuzzum creek, a distance of about four and a half miles. Another trail was made up the south fork a distance of about two miles. All the transportation up the creek was done by man packing; more work would be necessary on the trail to render it suitable for pack-horses to travel on.

The berth contains some good cedar, fir and hemlock, most of which is near the creek, but it will be difficult to get it out. The timber becomes scrubby and generally



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rotten on the inside at a distance ranging from twenty to thirty-five chains from the creek

As far as the berth extends, no minerals were found, but farther up the north fork graphite has been discovered, and there seems to be a possibility of this being mined in the near future.

Bears, deer and mountain goats are found in the mountains near the creek, and brook trout are plentiful.

The survey of the berth was finished on September 19, and it occupied two days for the party to move the outfit down to the railway. The next work was the survey of the northwest quarter of section 36, township 7, range 26. There is a small flat in this quarter section which contains about five acres of agricultural land which could be irrigated from Fivemile creek.

After finishing the survey of this quarter section the party was moved to North Bend by rail, to make surveys in townships 10 and 11, range 26, west of the sixth meridian. There are five or six settlers in township 11 who have taken up lands on the sloping benches. These lands are timbered with fir, birch and alder, and in parts are easily cleared. Two settlers on the east side of Fraser river have taken up quarter sections in sections 14 and 23, where there is some good timber which would be suitable for ties. No difficulty was experienced in crossing the Fraser about two miles above North Bend by means of an Indian dug-out canoe.

A wagon road is being built by the British Columbia Government from North Bend to Chaumox, a distance of about five miles along the Canadian Pacific railway. This road will allow the settlers to haul their produce to North Bend, which is a railway town, with car repair shops and yards for making up freight trains.

There are several creeks suitable for irrigation purposes in township 11, but none large enough for generating electric power.

After finishing the work in township 11, somewhat over three miles of line were run in township 10, where a tie was made to the Canadian Pacific railway right of way. The lines in this township were over high rugged mountains, and ran round an Indian reserve and two small farms.

The next work undertaken was at Keefers in township 12, range 26, where the party was moved by rail on November 21. Camp was made opposite Keefers station, and slight trouble was experienced in obtaining wood. The work undertaken lay in section 30 on both sides of the Fraser, which was crossed by means of the cable owned by the Canadian Northern railway contractors. There is a small area of flat land on the east side of the river in section 30, but it would require considerable clearing, and the soil is too rocky to be profitable. It contains some good fir for tie timber.

The country seen during the season in townships 7, 8, 10, 11 and 12, range 26, is all mountainous. The most desirable land was in township 11, where settlers will, after clearing their land, be able to market their produce with no trouble. The land in all these townships requires irrigation, and after this is effected vegetables and fruit of good quality can be raised.

The grading of the Canadian Northern railway which runs on the east side of the Fraser through these townships is nearly finished, and work on the bridges and culverts is being rapidly pushed ahead. It is expected that the railway will be open in 1915, and when the progress of the past year is considered this seems quite feasible, even considering the difficulties encountered in the Fraser canyon.

There are no summer frosts in the country covered by the season's work. The first frost was on October 14, and the climate generally does not run to extremes. There is considerable rain in the North Bend country during the late autumn, but in the summer the climate is dry except in the high mountains. No minerals of any value were found, and no coal-bearing formations were seen. Bears, deer and mountain goats are plentiful at a short distance back from the railway, and salmon are



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caught by the Indians, some of whom rely on this to some extent for their winter food. Grazing land is scarce, and the only cattle we saw did not appear to be in good condition for wintering.

The transport arrangements were effected by means of the Canadian Pacific railway and by hiring locally a team and wagon, as required.

The party disbanded at Keefers on December 3 owing to the difficulty of working on the mountain sides with snow on the ground.



## APPENDIX No. 35.

## ABSTRACT OF THE REPORT OF C. F. MILES, D.L.S.

## MISCELLANEOUS SURVEYS AND INSPECTION OF CONTRACTS IN ALBERTA AND WESTERN

## SASKATCHEWAN.

My work during the past season consisted in the survey of timber berth No. 1900, and a settlement and Roman Catholic mission at Green lake, and the inspection of contracts Nos. 14 and 33 of 1911, and Nos. 21, 22, 24, 25, 29 and 30 of 1912, in the province of Saskatchewan; also a reinspection of contract No. 14 of 1910, in the Cold Lake district in Alberta.

We left Edmonton on May 18, 1912, and followed the trail through Fort Saskatchewan, Bruderheim, Saddle Lake and St. Paul de Metis to Cold lake, a distance of about 200 miles. I commenced the survey of timber berth No. 1900 on May 28 and completed it on July 4.

While camping along this lake, we tried fishing with a net and caught whitefish up to six pounds in weight; we also caught salmon trout up to eight pounds in weight by trolling.

There is some excellent spruce on this limit, the best and largest, up to three feet in diameter, growing on the southerly part. There is also reported to be very good timber along the river that runs from Primrose lake into Cold lake.

A good deal of smoke was observed on the north and west sides of the lake during my stay there, but what damage was done by the fires I could not ascertain. Fires also entered the berth I was surveying from the east, but did no appreciable damage to the timber, at least not while I was in the vicinity. The most damage was done amongst the smaller trees along the shore of the lake, where the high winds off the water kept the fire moving. Fires were also seen along the west shore all the time I was camping on the lake, and were said to have been started by settlers and Indians in order to increase the area of their clearings. At one time the fire came in our direction, and we had to bundle everything into two punts and get out of its way.

On July 5 my outfit left French bay on Cold lake for Green Lake settlement by way of Frog lake, Onion lake, St. Walburg and Meadow lake, a distance, by section lines, of about 230 miles. We arrived there on the 25th after having, on the way, inspected the greater portion of contract No. 14 of 1911.

Settlement ceases about ten or twelve miles north of St. Walburg, and after crossing Fifteen-mile creek, we travelled through thick woods all the way to Rabbit creek, where there is a stopping place near where trail we had been following joins the one that leads directly from Makwa lake to Meadow lake. No more settlement was seen until we got within seven miles of Meadow lake, where we found some fine stretches of park-like country partly settled by a few French half-breeds, who are engaged in farming to a small extent, and in raising cattle and horses.

Beyond Meadow lake and along the trail to Green Lake settlement new settlers have come in, who are also engaged in cattle raising. They were cutting large quantities of hay in the flats of Meadow river. This river empties into Beaver river, which has low banks below the junction. Here also much hay was being made for herds of cattle brought in from the south, where herd law is in operation.

Green Lake settlement is inhabited by a number of old French half-breeds, some of whom have resided there for many years, and most of whom are old employees of the Hudson's Bay Co. They support themselves by farming on a small scale, having



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small clearings of two to ten acres. They have a few head of cattle and horses and, besides, are engaged in freighting, fishing, hunting and trapping. A fine church forms the nucleus of this settlement, which is presided over and served by a French Roman Catholic priest, who is also the postmaster and general adviser to the community. The Hudson's Bay company have an old established post there, as also have the Revillon Bros., a French concern with headquarters in France and Edmonton. Telegraph connection with the outside world is maintained by way of Battleford, and was successfully inaugurated during the past year. Trails from there lead to Prince Albert and to Battleford. The nearest railway is the branch of the Canadian Northern from Big River to Prince Albert, the distance to Big River being only about 50 miles by the canoe route.

I finished the survey of settlers' claims and the inspection of contract No. 14 of 1911 on August 17, and then left for contract No. 33 of 1911 by way of the Meadow lake and Makwa river trails. I crossed Horsehead creek on August 21 and commenced the inspection of that contract. There are several settlers along this trail. All engaged in ranching, and hay meadows appear to be plentiful. Some settlers from the vicinity of the Saskatchewan were cutting hay there, and intend driving up their cattle to winter them on Red Willow lake in township 58, range 21, west of the third meridian. On Meadow river, too, we met one outfit that had driven in over 300 head of cattle, and the men were cutting hay and putting up buildings with the intention of wintering there.

We finished the inspection of the contract on September 3 and moved south on the following day. There were heavy rains about this time and we were held up about fifteen miles from St. Walburg on that account.

From St. Walburg we drove by way of Onion lake and Frog lake to Cold lake in order to make a second inspection of contract No. 14 of 1910. I was getting very short of men and tried to hire some, both at North Battleford and Lloydminster, where I had gone to procure another supply of provisions, but without success.

On September 14 we arrived at Cold Lake post-office, where I succeeded in hiring a couple of Indians. We completed this reinspection on September 23, and left for Mervin the following day.

I returned to Lloydminster and North Battleford to secure some more help, but I had little success, as I secured only one man. I left the latter place on October 7 and rejoined the party at Mervin.

It strikes one as peculiar that north of the Saskatchewan there are so few cattle; thousands of acres are available for pasture, but no cattle are found. This I learned is the result of "herd law." If homesteaders would only fence in their little patches of crops, cattle might run at large and grow fat on the almost unlimited pasturage. As a rule, however, the homesteaders come in, do some ploughing, sow a little grain, and leave it while they attend to some other business, returning probably about harvest time. In the meantime settlers who have any stock must either herd them or drive them up many miles to the north where the herd law has not yet been introduced. It is my opinion that so long as herd law prevails, mixed farming will have to be suspended, and the extensive areas of pasturage go to waste.

Leaving Mervin on October 12, we travelled easterly by a trail to New Mervin, the present terminus of the grade of the Jackfish Lake branch of the Canadian Northern railway. Thus far we found the country fairly well settled, but along the trail east of Turtle river only a few settlers were seen. When we turned east on a trail that runs south of Turtle, Stony and Midnight lakes to Birch lake, quite a number of settlers were observed, engaged mostly in cattle raising. They were busy cutting feed, for winter use, in the extensive meadows near these lakes. We reached Kellogg's ranch on the west side of Birch lake on the 13th, and Birch Lake post-office the following morning. Continuing northeasterly for about six miles we passed about half a dozen settlers. We then entered the woods on the Pelican lake trail. Journeying



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along this trail 15 or 20 miles easterly and northerly we re-entered meadows, which continue northerly about five or six miles up to within a mile or two of Chitek lake. There a quantity of hay had been cut. In that vicinity there is a small Indian village, comprising about half a dozen families, who fish, hunt and trap and make hay for their horses. No cattle were observed around the village.

We continued our journey by the Green lake trail, which we followed southerly until we struck Big river, in contract No. 21 of 1912, on October 17. We camped in that vicinity, there being a considerable area of open prairie to the west of Big river. Much of the land to the north of the river consists of muskegs and marshes and there is a good deal of open country, but bush and burnt wood lie south of the river. I completed the inspection of this contract on the 26th and started the following day on our return to Birch lake, where we arrived on the 31st, having experienced some delays on account of stray horses. While my party camped there preparing returns of the inspection, I drove to North Battleford to hire some men and to purchase another team and supplies.

We experienced the first heavy fall of snow on November 9 at Birch lake. I procured some sleighs and left for contract No. 24 on the 12th, passing along the west side of the lake, through a good deal of meadow land. We passed a number of hay stacks, where several hundred head of cattle were being held and fed. We arrived at the contract on the 14th, but we experienced considerable trouble proceeding along the trails opened out by the contractor. They were opened out for wagons, and I, having sleighs, was compelled to cut down a great number of stumps nad remove fallen timber; in one instance it took us three hours to go two miles. We commenced inspection of this contract on the 15th and completed it on the 28th. Considerable time was lost on account of my only transit being damaged by a fall, necessitating my borrowing a spare one from Mr. Robinson who was working in contract No. 24. On the 29th we had to break the ice to cross a creek running out of Long lake, and on the following evening was registered the first minus reading on the thermometer.

We arrived at Birch lake on November 30 and having received notice of the arrival of my sleighs from Edmonton and my transit from Agincourt Observatory, where it had been repaired, I sent a couple of teams to Meota on the Jackfish Lake branch of the Canadian Northern railway to get them. The teams returned to camp with the sleighs on December 5 and on the 7th we started off again on the trail for Chitek lake to inspect contract No. 22, where we arrived in section 21, township 54, range 12, west of third meridian on the 9th. From there we travelled up the Green lake trail to the northwest quarter of section 31, township 55, range 11, and after retracing a block there we moved southerly to section 9, township 53, range 12, where we retraced two blocks, completing the inspection of the contract on December 21. We then started on our return trip to Birch lake.

So far as I am aware no cultivation of the soil has been carried on in this part of the country, and I would judge that the open parts would be better adapted for the raising and feeding of cattle, than for the growing of cereals. We found much jack-pine and spruce throughout the more northerly part of this contract, but these do not by any means indicate a good farming country.

We returned to Birch lake on December 24 and, leaving my outfit there, I drove to Meota and thence by train to North Battleford in order to purchase some supplies.

I returned to Birch lake on December 28, and left there with my outfit on the 30th for the inspection of contract No. 25 of 1912. We travelled northwesterly over a good deal of meadow land to Midnight lake, crossing to the west side of the lake, on the ice. About half a mile farther west we struck the new provincial Government road to Meadow lake. This road is said to have been greatly improved during last summer, all the soft places having been corduroyed; it makes a good sleigh road now, and possibly may be a fair summer road too.



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I reached this contract on January 1, 1913, and on the following morning moved to the northeast quarter of section 2, township 56, range 16, west of the third meridian, and camped on the north side of a lake. From there we retraced two blocks in townships 57 and 58. Like the other townships inspected last fall and winter, muskegs appear to abound; the surface is divided up into muskeg, jackpine ridges and poplar groves of less or greater extent, the first or second of the three predominating in the various townships. The latter indicates the better class of land, the first the richer soil, and the second generally consists of light sandy soil. It is my belief that this section of the country will ultimately become a good cattle country after repeated fires have cleared off the timber.

While camped in this district our thermometer for the first time during the winter registered lower than 40° below zero; in fact at my camp it was 44° below and at the contractor's camp about four miles north, 47° below. From this camp I moved across the lake and from there cut a trail south through about four miles of muskeg.

Rabbits were more plentiful in this district than I had ever seen them in my fifty years of survey experience, but they were afflicted with some disease, and were dying off by scores. At one place where we camped about four days, eight dead rabbits were found behind the tent when we removed it. Invariably when I left my tent to go to the cook's tent for a meal, half a dozen of them would be found in it on my return, sometimes one or two of them dead.

On January 12 we started out for the Government road, and on the 13th drove south past Midnight lake to Stony creek, which runs from Midnight lake to Stony lake. On January 18 we started westerly by way of Stony, Turtle and Island lakes for Brightsand lake, over trails that had not been broken and which were therefore rather heavy travelling in the open places. Generally the north and south trails communicating with the railway are well travelled, but the lateral trails in winter are but little travelled and when the snow comes to any depth they are very heavy.

We arrived at the southwest quarter of section 20, township 53, range 20, west of the third meridian, on January 21, and camped on the west shore of Brightsand lake, and on the 24th we left for Redwillow lake in section 17, township 58, range 21, west of the third meridian. There we traversed the lake, which formed a part of contract No. 33 of 1911. On the shores of this lake were domiciled some parties from the vicinity of Saskatchewan river who had driven in their cattle during the summer, cut hay and were wintering them. The hay is mostly slough hay, but the cattle were apparently thriving on it. In the spring these parties intended to drive their cattle south again to their homesteads. North of this we saw no more settlers' outfits but we saw some Indians, some of them living in houses, in the vicinity of which they had been putting up hay for the few horses they own. We travelled north as far as section 4, township 63, range 20, in contract No. 30 of 1912. Up as far as Beaver river we found recent Indian sleigh tracks, but after that we found it much heavier going, the snow becoming deeper. The immediate banks of Beaver river in this vicinity are not nearly so high as those twenty or thirty miles farther west, where they measured 200 feet or more. The banks of the Waterhen, where we crossed on the ice, are low, the river itself being about 5 chains wide, and apparently shallow. Farther down, the river widens out, the immediate banks being only a foot or two above the level of the water, and probably twenty chains in width. On both sides lay what appeared to be strips of meadow making a total width of probably half a mile. The river is shallow, as at various places where we had to cut through two feet of ice to water the horses, the depth of water generally was not more than a couple of feet below the ice. In one or two places we found a small quantity of hay cut by the Indians, also a stable and a few isolated shacks. The country generally appears flat and is timbered with poplar, spruce and tamarack, with dense willow in places. The general appearance strikes one as being that of a country best adapted for cattle raising. We passed various Indian hunting and trapping camps, where they had apparently fish and meat





Photo by G. H. Blanchet, D.L.S.  
Grand Rapids on the Athabaska. Loon River Entering on Right.



Photo by E. Deville, D.T.S.

Road Construction at Banff.







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in abundance. Moose and deer are very plentiful, the former being observed almost daily, and judging by their tracks in the woods, the Indians would have no difficulty in procuring a good supply of fresh meat.

From contract No. 33 we moved along Waterhen river down to contract No. 29, and then struck south to Beaver river, where we inspected two townships. By this time the snow had fallen to such a depth that we found it somewhat difficult to make satisfactory headway, the trip from the Waterhen down to the Beaver occupying a whole day. I therefore concluded to bring my season's work to a close. Travelling along the Beaver for a few miles we found it flooded, the weight of the snow having brought the water up on top of the ice. I then decided to strike out by the shortest way to the Meadow lake trail. We arrived at the Meadow Lake post on February 18. After purchasing a few necessities at the Hudson's Bay company's post we started on the trail which was fairly well broken, and arrived at Brightsand lake on the southwest quarter of section 20, township 53, range 20, on the 21st. There I made arrangements with Mr. Ole Thorson to winter my outfit. I arrived in Battleford on March 1 and paid off the men on the 3rd. I reached my home in Toronto on the 8th.



## APPENDIX No. 36.

## ABSTRACT OF THE REPORT OF J. B. McFARLANE, D.L.S.

SURVEY OF PART OF THE FOURTH MERIDIAN AND OF PART OF THE TWENTY-FOURTH BASE LINE  
WEST OF THE MERIDIAN.

During the summer of 1911 I had run the fourth meridian as far as the north-east corner of township 105. As this point was too far north for me to attempt to pack the outfit and supplies from Clearwater river, an attempt had to be made to reach it from the north, that is, from Athabaska lake, and to work from a cache to be located or some portion of the lake. With this purpose in view all possible inquiries were made when I was at McMurray in 1911 about the country between the end of the line and the lake. However, little was to be learned except from the Indians, and their answers are nearly always ambiguous.

I left Edmonton on May 3 with my party and outfit, shipping a car to within eight miles of Athabaska Landing. From there the outfit, supplies and oats for feed had to be freighted to Athabaska Landing. I left the latter place with two scows on May 8. My pack horses which had wintered at Ray left Edmonton on May 2 but I had been entirely misinformed about the time taken to reach McMurray by trail and I had to wait considerable time for these horses. On June 3, I placed a cache at the cascades on the Clearwater for work on the twenty-fourth base line and for the trip out. Then returning down the Clearwater I took the outfit and supplies down Athabaska river to Athabaska lake and thence across to Old Fort river and built a cache about three miles up that river. I had learned at Chipewyan that this was the river which ran along the meridian in township 105, so I chose this spot for the cache as it was convenient to all parts of the proposed line. Here there was another wait of a few days for the horses which were taken to the fourth meridian from McMurray by the trail along the twenty-third base, and thence up the meridian trail and down Old Fort river to its mouth. The outfit was packed up this river and work commenced on the meridian on July 2. The horses had travelled over six hundred miles by land and the outfit by land and water about the same distance before any line was run.

The country through which the fourth meridian was produced in 1912 is much more valuable than the land through which it was run the previous year. The elevation is lower and grass is much more plentiful, and much of the land will be available for ranching. River and creek valleys have good grass in them and considerable scattered grass is found among the hills. This was not the case with much of the land to the south where we had to depend on beaver meadows for horse feed.

The country through townships 106, 107, 108 and the south half of 109 is in general much the same, consisting of rolling or undulating sand hills covered with small jackpine and *brulé*, and dotted with small lakes, some of which have no outlets. A small proportion of the land is stony. The water in the lakes is generally good, and many of the larger ones have sandy shores. The valley of Old Fort river follows the line closely through these townships and it becomes deeper and narrower farther north. It is nothing more than a large creek in township 105, but it is joined by Beaty river, which is of about equal volume, in the middle of township 106, and is then except at some rapids, too deep to wade. The narrow river flats are generally covered with grass and willow. In township 108, Douglas river, a stream 100 feet wide and three feet deep with a rapid current, joins the Old Fort, and the latter, from there down, would be navigable for scows except that the rapids are too numerous and too



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long. In this township the river turns west for about ten miles and then north again. There are no tributaries of appreciable size on the west bank of the river, as a range of hills about five miles west of the river seems to form a watershed. These hills extend to the north to Old Fort point. All timber is kept burnt off or stunted by forest fires which appear to burn regularly and systematically. Back from the river and its tributaries the land is more level. In the centre of township 107 a large muskeg crosses the line and stretches away to the east. The muskegs are valuable in that they have kept the accumulation of soil from being destroyed by fire, and when drained they may become fertile lands. The timber on these is stunted and of little value.

From the middle of township 109 north the surface of the country is quite different. Muskegs cover a large proportion of the land. The pack trail which was chosen so as to avoid these is about twice the length of the line. In the north of township 109, a shallow lake, a mile wide by a mile and a half long, lies across the line. It has a muddy sandy bottom and the entire lake is dotted with water lillies and weeds. A creek one hundred feet wide, and with very little current, flows in at the east end. It resembles the lake in bottom, depth and vegetation and, like the lake, has a stretch of muskeg and swamp on both sides. The outlet of the lake, Harrison river, flows through a swampy flat containing another small lake, then enters a rolling stretch of country, where the river has some rapids. North of the shallow lake the line continues in muskeg to section 25, township 110. Some of this muskeg has been burnt over and, in places, thick grass three feet high had grown on the *brulé*. I believe that these lakes and this muskeg which stretches away to the northeast could be drained and made into a fertile flat containing an area about equal to a whole township. North of this muskeg the line crosses a range of rolling sand hills about two miles wide, then a creek flowing west to Harrison river runs through a narrow meadow across the line. This creek has its rise in innumerable lakes and wide stretches of muskeg to the east. North of this the line crosses an elevation covered with boulders, then about two miles of muskeg, while the pack trail follows rocky ridges, probably a series of moraines, to the northeast. These ridges are cut off by small muskegs in all directions. From the middle of township 111 to the north of township 114 the country is a succession of stretches of muskeg from a few chains to a mile or more in width held in by ridges of sand or sand and boulders, or occasionally by some low rolling sand hills. Lakes are numerous and are of all sizes up to several miles in length. The longest triangulation during the season was two miles in township 114. The creeks are all small through the above stretch of country and meadows are scarce, but some of the lakes have slough grass in bays and around the shores. A well-beaten Indian trail from Old Fort bay crosses township 112, striking the meridian near the northeast corner of section 25. Thence it goes on easterly among lakes and muskeg, where it soon becomes indistinct. The only marked valley near Athabaska lake is that of a large creek which crosses townships 113 and 114 in a northwesterly direction. Through these townships the valley is about one hundred feet deep and a mile to two miles wide. When this creek enters township 115 it flows west about three miles down a number of rapids in a narrow ravine, crosses the line, then turns north with only a range of sand hills between it and the lake, and recrosses the line at the northeast corner of section 1, township 115. It enters the lake proper about a quarter of a mile east of the line, but recrosses the line again on the three-quarter mile sand beach. On section 1 the creek flats are about twenty to thirty chains wide and a beautiful hay meadow lies along the creek. There are also several smaller meadows up the creek. This stream is about eighty feet wide and two feet deep, with a current about one and one-half miles per hour. The land to the northeast of this creek is fairly level and dry, covered mostly with jackpine. A fire burnt over most of townships 114 and 115 early in the summer of 1912.

A great deal of red sand was seen through this country but there is not enough iron in it to form an ore.



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By September 10 the meridian was run to Athabaska lake and we were ready to move back along the meridian to the twenty-fourth base line, but part of the pack train had made a trip down the meridian to township 102 with supplies for the long trip. These arrived back at the lake on the 13th, and on the following Monday we left the camp on the meridian at the lake and travelled south by the sandy beach of the lake, as this was excellent travelling and much shorter than the pack trail up the line. Good feed was found on a small hay meadow at the mouth of Harrison river at Stone point. When we reached the point north of Old Fort bay the horses were sent around the bay and the outfit was taken across the narrow neck of water on a scow.

The most beautiful hay meadow I have ever seen lies on the point just west of the mouth of Old Fort river. The hay stood from three to five feet high and grew thick on the ground. The area would probably be about two square miles and although willow encroach on the southern part, the northern part is very clear. The water in Athabaska lake was much lower than in June, and on the main shores there is a beautiful sand beach a quarter to a half mile wide, broken only by a few narrow stony points. In the Old Fort bay this beach was a muddy sand with poor vegetation.

On September 23, we left the cache on Old Fort river and moved down the river to the fourth meridian reaching the twenty-fourth base line on October 7. A pack trail had to be cut across range 4 so that work was commenced on the base line on the 14th.

Through ranges 5 and 6 the line lies in undulating and rolling country consisting of sandy ridges and hills with muskeg between. A fire overran most of this country early in the summer of 1912 and killed most of the timber on the dry ground and burnt through some of the muskegs. A patch of twelve-inch poplar on section 33, township 92, range 5, and many sixteen-inch spruce scattered along ridges in sections 1, 2 and 3, township 93, range 5, were fire-killed. The creeks in these townships are small, have a good fall and drain in general to the southeast. On November 4 the line reached the middle of range 6, and my assistants and men refused to go any farther west on the base line, consequently I was forced to quit work for the season, although it was not yet possible to travel out on the ice.

Levels were run throughout the season, work commencing from bench-marks established in 1911 and using the elevation then given them. Levels between each two bench-marks were checked by a separate line of levels. The elevation at the northeast corner of section 36 township 105, range 1, west of the fourth meridian, is 1260 feet. This soon drops to the north as the line enters the valley of Old Fort river. Most of the north part of township 106 and practically all of township 107 lies between 1,100 and 1,200 feet. In townships 108, 109, 110 and 111 the elevation varies around 1,100 feet, local depressions going over 50 feet below, but little change in the general elevation. In township 112 the average elevation drops about 50 feet and township 113 is very level, with an average elevation of about 1,025 feet. The south half of township 114 is about 1,000 feet, but the north half gradually drops to below 900. In township 115 the elevation drops to 843 at the first crossing of the large creek, then rises to 871 to drop again to 842 at the second crossing of the creek. The sand bank between this and Athabaska lake rises to 893 feet. The ordinary high-water mark was 848 feet and the water level on September 9 was 840 feet.

On the twenty-fourth base line the elevation gradually drops quite uniformly across range 5 from 2,255 feet at the east to 1,898 at a creek about the middle of section 31. From that point there is a gradual rise for two miles till an elevation of 2,023 feet is reached. The elevation is about 2,000 feet on an average for the last mile and a half of line run.

By December 5, Clearwater river was frozen sufficiently to travel on and we left there on that day by the winter trail to Big River settlement, and reached Edmonton on December 25.



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## APPENDIX No. 37.

## REPORT OF GEO. McMILLAN, D.L.S.

SURVEY OF THE TWENTIETH BASE LINE WEST OF THE FOURTH MERIDIAN.

FINCH, ONT., January 27, 1913.

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa, Canada.

SIR,—I have the honour to submit the following general report on my survey of the twentieth base line west of the fourth meridian, during the season of 1912.

I left Ottawa on April 10 and, after outfitting in Edmonton, I hired two teams and left for the work on April 29, my supplies having been forwarded during the winter by Mr. J. N. Wallace, D.L.S. The route followed was by Fort Saskatchewan, Bruderheim, Star, Wostock, Whitford lake, Pakan, and Beaver river to lac LaBiche. Another route that might have been taken thus far was by Athabaska Landing and then eastward to lac LaBiche, but by the latter the roads are said to be bad during the spring season.

On May 11, I reached Spencer's ranch at the east end of lac LaBiche where the wagon road ends; the two freighters were sent back and our own horses were packed from there. From Spencer's we travelled by the pack-trail leading to McMurray as far as Sandy lake in township 74, range 11, and then by a hunter's trail that passed near the cache located last winter by Mr. Wallace. The cache was near the middle of township 76, range 11. From there to the starting point of our work, a distance of about ten miles we cut our own pack-trail and reached our destination on May 24. The weather was cold and there had been no growth; consequently, the horses were beginning to fail for the lack of grass.

On May 27 we began work on the base line by offsetting the northeast corner of range 10, a distance of 3.02 chains to the north, and then producing the line westward from that point.

In range 10 the surface is low and a considerable part of it has been overrun by fires so that much of the timber is fire-killed. The green timber is small and of little value. The first appearance of grass was about June 1 in the valley of May river near the beginning of the range. This was a great treat for the horses as they subsisted for sixteen days on dead grass and leaves. There are some small meadows and blueberry patches in this range.

Townships 75, 76 and 77, ranges 11 and 12, are mostly covered with muskeg, and the natural drainage is not good. These townships are timbered with small spruce, jackpine and tamarack, the soil being almost valueless as a timber producer. Some good grass grows along the lakes and streams, but nowhere else. The surface of township 78, ranges 11 and 12, is higher and timbered with small jackpine poplar and spruce. The soil is light and sandy and not fit for agricultural purposes.

Range 13 is rolling and timbered with spruce, jackpine, poplar, willow and alder, and contains much windfall. The low land is too wet to be utilized and the high land too light and sandy for agricultural purposes. It serves a good purpose, however, in growing timber. Ranges 14, 15, 16 and 17 are well timbered and they contain a large percentage of good agricultural land. Some of the timber is suitable for milling purposes and pulpwood. There is an abundance of blue-joint hay.



House river crosses the line in range 14; it is the largest stream met with during the summer, except Athabaska river. It is about one chain wide, flows very swiftly in places and varies in depth from six inches to two feet. The banks are low and the soil adjacent is loamy and rich, and supports a heavy growth of grass. This locality is suited to farming and stock raising and plenty of hay can be procured, but at present the lying timber will not permit of the operation of farm machinery. It is, however, good grazing land with a permanent supply of good water.

The location survey of the Alberta and Great Western railway, and also the sleigh road used by the railway company in forwarding their supplies, are intersected in section 32, range 15. This sleigh road follows the muskegs and open swamps and is adapted for winter use only.

Athabaska river was crossed in section 31, range 18; it is twenty-seven chains wide and about twelve feet deep in low water, with a valley 104 chains wide and 370 feet deep. Both slopes are densely timbered with second-growth poplar, large black poplar and some fairly large spruce. The soil is a clay loam and from it ooze numerous small streams and springs which seem to be alkaline. The water from those springs was the only impure water met with all season. Athabaska river is navigable for flat-bottom steamers as far down as Pelican rapids, in township 80, or thereabouts. Scows laden with merchandise for the far north and others with settlers' effects were seen floating down almost every day while we were camped on the river.

For a mile west of Athabaska river there is a rim of firm soil but from there on to Pelican mountain, a distance of twelve miles, there is an uninterrupted muskeg. It was the wettest and most troublesome muskeg to cross that we encountered; almost the whole length of it had to be corduroyed or brushed that it might bear the pack horses.

From the end of range 20 to the end of range 26, the base line follows Pelican mountain. The surface is rolling and densely timbered with spruce, jackpine, poplar, balsam and birch of fair size. There is some milling timber and a great deal of smaller size, suitable for pulpwood. The soil is cold and sticky, and not suited for agricultural purposes. There are numerous small streams all flowing to the north and converging before leaving Pelican mountain. In range 26, these streams have valleys about 100 feet in depth but about three miles north when they have left the mountain, the banks flatten out. Townships 75 and 76, ranges 21, 22, 23, 24, 25 and 26 are more suited to raising timber than to farming, although much of the soil is too light and wet to grow anything but scrub.

To the north of Pelican mountain, in ranges 24, 25 and 26, there is a flat of good land suitable for farming when cleared. At present it is timbered with spruce, jackpine and poplar of medium size. This area is well watered, has a good natural drainage and is adjacent to two lakes containing whitefish. The sleigh trail from Athabaska river to Wabiskaw passes through township 78, range 24.

The facilities of transportation into the district crossed by the twentieth base line consist of the two winter roads previously mentioned, and Athabaska river, but none of these can be made use of during the entire year. The soil varies from sand to a clay loam, together with muskeg. There are two blocks already referred to where the soil should grow good crops after draining and clearing, and the remainder will grow timber.

To the east of the Athabaska the surface is rolling and to the west very rolling and hilly except on the muskegs. There are no prairie lands, as the surface is all timbered. There is very little high land scrub, but the muskegs are all scrubby. Sawlogs, ties and pulpwood can be procured on all the high lands. Hay of the blue-joint variety is plentiful in townships 75, 76, 77 and 78, ranges 15, 16, 17 and 18, and in a few other places. There is a permanent supply of water everywhere. There are no large water-powers, but a small amount of power could be developed on House river by the erection of dams.



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The indications are that the climate will be suited to the raising of crops, although at present there are some light summer frosts. The rainfall is like that of eastern Ontario. Wood for fuel can be procured anywhere. No coal, lignite, stone quarries or minerals were seen, but oil development is in progress in some places along the Athabaska.

The game comprises moose, deer, black bears, foxes, coyotes, lynx, rabbits, partridges, ducks and geese; whitefish are caught in all the larger lakes.

I have the honour to be, Sir,

Your obedient servant,

GEO. McMILLAN. *D.L.S.*



## APPENDIX No. 38.

## ABSTRACT OF THE REPORT OF A. L. McNAUGHTON, D.L.S.

## SURVEYS IN THE BRAZEAU DISTRICT.

On June 29, 1912, I left Edmonton for Coalspur on the Alberta Coal branch of the Grand Trunk Pacific railway, as this was the nearest point on the railway to my work, and on July 2 pitched camp in section 25, township 48, range 22, west of the fifth meridian, where our first work was located. Subdivision in townships 47 and 48, range 22, and townships 46 and 47, range 23, engaged the party until November 26. On the 27th the traverse of McLeod river was begun and, on the following day, my assistant left with half the party to finish some mounding in the vicinity of the Alberta Coal branch which had been left over from the previous season's work. With the remainder of the party I continued the traverse of McLeod and Beaverdam rivers, which I finished on December 9. On the 16th, the whole party, having completed all unfinished mounding, arrived at the twelfth correction line south of the Pacific Pass mines. On January 15, 1913, having finished our work in this vicinity, we returned to Mile 8 on the Mountain Park branch. From this camp three miles of the twelfth correction line was run, which finished the subdivision of all the country traversed by that branch. On February 1, we left for Edmonton where we arrived a few days later. Here I paid off and disbanded my party, and leaving Edmonton on February 10, arrived in Kelowna on the 12th.

The country covered by my work is reached by the Alberta Coal branch of the Grand Trunk Pacific railway. The Mountain Park branch leaves this line at Coalspur and, following a general southwesterly direction, enters the mountains twenty-four miles from that place, and terminates at the Mountain Park mines, eight miles farther south. Track-laying was begun on this branch on December 10, 1912, and I believe it is now well under way, and the road will perhaps be open for traffic during the summer of 1913. This gives easy access to the district in which most of my season's work is situated. The twelfth correction line south of township 47, range 19, is reached by a pack-trail running south from the Pacific Pass mines which are situated at the terminus of the Alberta Coal branch. There is a good deal of muskeg along this trail, and I believe it is somewhat difficult for loaded horses during the summer months.

The soil along the south boundary of township 47, range 19, is mostly a clay loam, which is very retentive of water. On this account, and because of the cold summer weather, it is of little value for agricultural purposes. The same observations apply to the soil along the northerly part of the Mountain Park branch. As one approaches the mountains the soil becomes more gravelly and the cuttings along the railroad generally alternate between gravel and solid or shale rock. In this district is found some of the best and cleanest gravel I have ever seen.

Foot-hills of varying height cover the whole district, surveyed, but the country in the vicinity of the twelfth correction line across range 19 is level to rolling, with a great deal of muskeg. The northerly part of township 48, range 22, is also rolling country, while southerly and particularly along the valley of McLeod river, the hills are higher and more rugged in appearance. McLeod river and the Mountain Park branch enter the mountains near the twelfth correction line. South of this line our work was somewhat more difficult and even dangerous, as the season was so far advanced that the slopes were covered with snow and ice.



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Fire has swept over the greater portion of the district and consequently there is very little timber of commercial value. Along the north side of McLeod river, near the east boundary of township 48, range 23, there is a considerable area of green timber, spruce, jackpine and balsam which would be suitable for railroad ties. Timber of the same general quality was also seen along the twelfth correction line across range 19. I have been informed that fire-killed timber, if not rotted, makes the very best material for mine props, being much superior to green timber for this purpose. No doubt, therefore, use will be found for a small part of the dead timber which covers the country.

Good water is everywhere abundant in this country. Although McLeod river is very rapid, the character of the valley renders the development of water-power difficult. The most promising site for a power plant along this river is in township 47, range 23. Here the river, at one point, enters a canyon between two perpendicular walls of rock about thirty feet in height and about seventy feet apart. With small expense a dam could be constructed here and no doubt will be at some future date. At present the proximity of coal, capable of being cheaply mined, and the absence of any market for power render the project impracticable. One difficulty in the operation of such a plant would be the large quantity of frazil ice in the river during the winter months.

On account of the high elevation frost is liable to occur on a clear night during any month of the year. During my three seasons' experience in this district, I have seen snowstorms in each of the summer months. Rain is very frequent and during the latter half of August and the first half of September, scarcely a day passed without at least a shower. The fall weather, as usual, was very fine and no severe cold was experienced till about January 10, when we had sixty or seventy degrees of frost.

No outcrop of coal was noticed during the season, but several seams were seen in the cuttings along the Mountain Park branch. These were too near the surface to give any fair indication of the quality of the coal beneath. I did not have any opportunity to visit the Mountain Park coal mines, which lay outside my work, but have been informed that the quality of the coal taken out there is superior to that obtained in the foot-hills. Both the Yellowhead and Pacific Pass mines are now regularly shipping coal, and the indications are that this district will experience a steady growth in population and prosperity and will, in time, become one of the largest coal producing areas on the continent.



## APPENDIX No. 39.

## ABSTRACT OF THE REPORT OF E. A. NEVILLE, D.L.S.

## SETTLEMENT SURVEYS ALONG SLAVE RIVER.

I organized my party at Edmonton, and from there proceeded to Athabaska Landing. For the transport of the party and outfit, I purchased a ten-ton scow and two canoes, and arranged to travel down the Athabaska from Athabaska Landing with the Hudson's Bay company's transport outfit. We left there on May 25, 1912, and on the 29th reached Grand Rapids, where we were delayed until June 5 awaiting the portage of the transport across Grand island, then continuing our journey we safely navigated the Brulé rapids. Upon reaching the Boiler rapids I hired a pilot from the Hudson's Bay company, according to arrangements which I had previously made with them. I also did this at the Long and at the Big Cascade rapids. All the remaining rapids were passed unassisted, following in the wake of the company's scows, and I finally reached McMurray on June 7. Owing to the company's transport being unusually large, I was forced to leave it behind and drift down the river. On reaching the mouth of Athabaska river, the heavy wind delayed me for a day, but as it calmed down in the evening, I effected the crossing of Athabaska lake during the night, and arrived at Chipewyan on the morning of June 16, two days ahead of the Hudson's Bay company's transport.

Chipewyan, with its rows of white houses, presented a very pleasing appearance when approached from across the lake. The rocky hills formed a picturesque setting, and the teepees of the Indians on their semi-annual visit added a touch of romance. The scattered tribes visit the settlements during June to receive treaty, and also come in at New Year to join in the holiday festivities.

The population of Chipewyan will average about two hundred, almost all of whom are engaged in hunting, trading and fishing. Scarcely any land is available for agriculture, but a few gardens are found between the rocky hills.

Following the instructions issued to me, I mounded the settlement of Chipewyan, which I completed on June 24, and the following day I departed for Smith Landing. I safely navigated the rapids in Rocher river, and proceeding down Slave river without any further interruptions, I arrived at Smith Landing on the 28th.

I was engaged for seven weeks in making the survey of this settlement, which extends about eight miles along the river. At the time of my visit the population was between two and three hundred, 95 per cent being Indians. The soil in the vicinity is first-class, consisting largely of heavy black clay loam which is ideal for the production of all kinds of farm produce, such as vegetables, hay and grain. The land, moreover, is easily cleared. At the present time nearly all grain used in this country is imported from Edmonton or Athabaska Landing, but this state of affairs bids fair to be speedily remedied, because, from experiments extending over many years, it has been amply proven that even in that northern clime, grain can be successfully produced. If the alacrity shown by the more progressive Indians in settling and clearing the newly surveyed homesteads is to be taken as any criterion, one can safely predict that in a few years, following perhaps better facilities for transportation, these fertile northern lands will form a valuable addition to the granary of the Empire.

The surface of the country at Smith Landing is mostly flat and gently rolling, and is well wooded, the prevailing species of timber being black and white poplar and



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spruce, the latter attaining a diameter of about two feet. With the advent of the Government saw-mill, much building is going on, opening up new avenues of employment for the hardy pioneer.

Hay is obtained from the sloughs within the settlement and also from the islands in Slave river, from which it is transported during the winter on the ice. The quality is that of ordinary slough grass, and there is an abundance of it for all ordinary requirements of the settlers.

The water is all fresh and at present is supplied by the primitive method of dipping from Slave river, but good water can easily be obtained by sinking wells to a depth of from fifteen to twenty feet. There are no streams through the settlement, and the land is not liable to be flooded.

Below Smith Landing there are sixteen miles of rapids on Slave river, having a drop of approximately 140 feet in sixteen miles. It could be dammed and much water-power developed.

Upon the completion of my work in this vicinity, teams were hired and my outfit transported across the sixteen-mile portage to Fort Smith, over as good a road as it has ever been my pleasure to travel.

Fort Smith is beautifully situated and is high and dry, being on the level plateau, one hundred and fifty feet above Slave river. The general characteristics of the district resemble those at Smith Landing. The soil is mostly a sandy loam. The Government Experimental Farm, under the able supervision of Mr. A. J. Bell, Dominion Government agent, is leading the way in agricultural pursuits, and the results of the experiments are very satisfactory.

Fort Smith is noted as being the head of continuous navigation for fifteen hundred miles to the Arctic ocean. At present three small steamers ply from this port down the Slave and Mackenzie rivers. I am informed by Mr. Brabant, chief factor of the Hudson's Bay company for Mackenzie district, that the Company is contemplating bringing supplies into this country from the Arctic and up the Mackenzie in the near future, as a cheaper and safer method of transportation than that now employed of using scows down the Athabaska.

A few remarks at this juncture regarding the Salt river country, twelve miles northwesterly from Fort Smith, might be of interest to the Department.

The great natural salt beds of Salt river are well known. I will only mention in passing that pure salt is here as plentiful as sand on the seashore, and the supply used in this country, for all purposes, is obtained from this source. Here also are found the last great prairies, where the noble buffalo reigns supreme, protected from ruthless slaughter by the Canadian Government. But they are bound to be driven before the onward march of the Canadian farmer, for these prairies are already being claimed as the farmer's heritage. The Roman Catholic mission has, as usual, turned the first sod and now has a ranch of nearly one thousand acres, producing cattle, horses, hay and grain. The Government has here also a large Experimental Farm in a flourishing condition.

The summer weather conditions are ideal. The days are warm, the nights are cool, but frosts during June, July and August are rare. For several weeks in June and July there is no darkness, accounting of course, for the rapid plant growth. The winters, I believe, are scarcely more severe than those of the Manitoba prairies, but the season is longer.

The chief industry of the district at the present time is fur-trading. The rival companies, the Hudson's Bay company and the Northern Transportation company have posts at all settlements. Fish and game, consisting of moose, deer, caribou and water-fowl, as well as the ordinary fur-bearing animals, are plentiful.

I was occupied approximately five weeks in making the survey of Fort Smith settlement, which extends about six miles along Slave river; I believe the available surveyed homesteads will be sufficient for several years to come.



On September 25, I left Fort Smith on my return journey, crossed the portage to the landing, and through the kindness of Mr. Bell was permitted the use of the steamer *Rex* to take me up Slave river. On board this tug I left Smith Landing on September 27, and reached the Little rapids on Rocher river on the evening of the 29th. Here it was necessary to leave the steamer as it could not stem the rapids. On the following day, tracking was resorted to, and I arrived at Chipewyan on the same day.

At Chipewyan, supplies which I had cached on my way down, were taken on board, and I left there on October 1, paddling across Athabaska lake and up Athabaska river. With beautiful weather and continuous paddling the party arrived at McKay on October 10. Above this point the river flows too swiftly to paddle against, so I disposed of one canoe, putting all the baggage in the remaining one, and after two days' hard tracking reached McMurray on the 12th.

This is where the most difficult part of the journey commenced. The water was very low as the snowfall in the mountains had been light the year before. It was necessary to lengthen the tracking line to 250 feet, and even then the canoe drawing about ten inches would not float clear of the shoals and rocks. At times this necessitated wading knee-deep in the icy waters, but happily conditions improved when the Crooked rapids were passed and with the usual portage we slowly advanced up the river and arrived at House river, ten miles above the Grand rapids on October 22. Here we met with a twelve-inch fall of snow which made travelling hard and unpleasant, as it was necessary to walk along the shore and track the canoe.

Daily the weather was growing colder and ice began to drift in the river on the 29th, finally stopping the canoe on the 31st, a short distance below Calling river and about fifty miles from Athabaska Landing. At Calling river I was fortunate in obtaining pack-horses, and thence following the Government telephone line I arrived at Athabaska Landing, overland, on November 4th.



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## APPENDIX No. 40.

## ABSTRACT OF THE REPORT OF T. H. PLUNKETT, D.L.S.

## BASE LINE SURVEYS IN MANITOBA AND SASKATCHEWAN.

SURVEY OF THE THIRTEENTH AND FOURTEENTH BASE LINES IN THE VICINITY OF THE  
.. PRINCIPAL MERIDIAN.

I organized my party at Winnipeg, and, on February 14, 1912, the party and equipment arrived at Chemong siding on the Pas branch of the Canadian Northern railway, ready to commence the survey of the thirteenth base through ranges 32, 31, 30, 29 and 28, west of the principal meridian. A few days were spent in reaching the starting point of this base, and actual survey operations commenced on February 17.

The country traversed by this line was mainly of a swampy nature, the surface being almost entirely covered with moss, varying in depth from three inches to two feet. Numerous floating bogs were crossed, but, generally speaking, there is a solid bottom of gravelly clay or of sandy loam lying about eighteen or twenty inches below the moss. Between the moss and clay lies a layer of black muck. The floating bogs are a semi-liquid mass of decaying vegetation, extending, as a rule, in a north-westerly and southeasterly direction, and are sometimes of a considerable depth, rendering travel over this country in summer almost impossible. Notwithstanding the fact that the country has ample slopes for drainage to the water-courses, it remains inundated over large areas after the snow has disappeared in the spring. This is caused by the carpet of moss, which prevents the water from reaching the outlets provided by the rivers.

During the course of the survey a few very narrow ridges were crossed, but these are inaccessible owing to the interlying swamps and bogs, and, even aside from this, they offer, in their present condition, meagre encouragement to the settler.

There is in this country a drainage proposition which, in my opinion, cannot be solved by individual settlers, but should be undertaken with a view to draining the whole country, following a well-devised plan. To allow homesteaders to attempt to convert this into farming land from its present condition is almost sure to result in failure, and hence would be a set-back to the development of what could be made, I think, a fair farming country. Notwithstanding the fact that public attention has been so forcibly directed during the past three years to this portion of the Canadian west on account of the railroad construction, past and present, no attempt at agriculture has been made, to my knowledge, along the already operating Pas branch of the Canadian Northern railway. This fact seems to prove conclusively that something must be done towards improving the drainage before settlers will attempt to work the land.

This is, of course, a bush country, the prevailing varieties of trees being spruce and tamarack. These are of no commercial value, and are, as a rule, small. South of the base line in ranges 28 and 29, spruce suitable for ties was found, but not in large quantities.

Overflowing river, a stream about eighty feet wide, was crossed in section 31, range 29. It flows northeasterly, with a current of two to three miles per hour. The banks are low and the country for a half-mile on either side shows evidences of flooding. No available water-powers were seen.

This base line was completed to the easterly limit of range 28 on March 15, and the outfit was then moved back to the second meridian, where work was commenced at once on the same base line west of the meridian and continued to the easterly limit



of range 2. The line in range 2 began the ascent of the Pasquia hills, and, as my party was to remain in the field continuously throughout the spring and summer, it was deemed wise to abandon the survey of this base at present and to return to it when the spring break-up rendered work impossible at lower elevations.

Accordingly, a move was made to Whitehorn siding, by train, and from there by dog teams to the point of commencement of the fourteenth base line on the second meridian, a distance of about twenty miles.

Work was commenced on this base on April 1, but no sooner had we begun, than the spring break-up commenced. By April 5 the snow was practically gone, and we found ourselves surrounded by a country flooded to a depth of from one to two feet. Wading through this ice cold water soon had its effect on the personnel of my party. There arose an irresistible desire amongst the labourers to seek more congenial employment. Every remaining member of the party became an axeman, and both line and outfit reached better footing in range 28, on April 18.

From the commencement of the base in range 31 to the western limit of range 28, the country showed every evidence of being flooded, in the spring at least, this notwithstanding the fact that six water-courses were crossed in this distance. In section 33, range 31, a river forty feet wide, with banks four feet high, flows north into Waskwei river, which, in turn, was crossed in section 31, range 30. Waskwei river at this point has a width of sixty-six feet, with banks six feet high, and flows north to join Carrot river. In addition to these rivers, creeks fifteen feet wide were crossed in sections 33 and 34, range 31. Pasquia river flows through section 35, range 30. This river is about one hundred feet wide, with banks five feet high. It flows north into the Saskatchewan at Pas. We found these rivers frozen almost to the bottom and were unable to determine their currents. These, of necessity, must be slow. At high water on the Saskatchewan, Pasquia river provides a channel for conducting the surplus Saskatchewan water over the country. From this peculiarity Pas receives its name, Pas being a shortened Cree expression for a river that flows in two directions. In section 33, range 29, a stream one chain wide was crossed. This has no well-defined banks, and meanders northerly through an extensive floating muskeg to join Pasquia river.

Ranges 31, 30 and 29 are, at present, utterly unsuited for agriculture, and the country presents serious drainage difficulties. Although we did not have an opportunity to observe the rivers at high water, there are numerous evidences that they are insufficient for the country's drainage.

In range 28 the country became more rolling, with fewer disadvantages to settlement, though it, too, is far from desirable agricultural land. On all sides deep moss covers the ground, but under this there is a depth in places of over two feet of black loam; other parts were clay, carrying limestone boulders. This range has been burnt over along the Canadian Northern railway.

The line passed through a country continuously wooded. In range 31, there is a large area of tamarack swamp. In sections 31 and 32, tamarack and spruce range from six to eighteen inches in diameter, but the tamarack is nearly all dead. Throughout range 31, considerable areas of this swamp were encountered in every section. These patches of timber alternate with low wet places, generally covered with dense willow brush. In ranges 30 and 29, the heavy timber disappears and gives place to a dense growth of small spruce and tamarack on the comparatively dry ground, while on the bogs there is a scattered growth of stunted trees of the same varieties. Throughout range 28 the country is wooded with a dense growth of small spruce, suitable only for cordwood. In range 27 the land appears to drop again.

Having reached the easterly limit of range 28 on April 23, it was decided to return to Chemong and continue the thirteenth base west of the second meridian. Dogs, which had been our means of transport during the winter, were now dispensed with and pack horses substituted for work on the Pasquia hills, where we were sure of solid ground.



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Work there was commenced on April 26. In range 2 we reached the base of the Pasquia hills. Regarding the land in ranges 1 and 2, there is no good reason why this should not be, in the future, a good farming country. At present, however, these ranges are covered with excellent merchantable timber, consisting of spruce and tamarack, and lumbering operations are now flourishing. There is a saw-mill in operation one mile south of Chemong siding, and lumbering is in progress all along the railway from Hudson Bay Junction to mileage 40.

In ranges 3 and 4, the line crossed the Pasquia hills. The summit of these hills is 1,348 feet above the level of the Canadian Northern railway track at Chemong siding. These hills are cut up by deep ravines, through which flow streams of good water. The land is mostly too rough for farming, and no attempt to cultivate it will likely be made for some time. An excellent view of the surrounding country is to be had from the summit of the hills. The side slopes are wooded with spruce, birch and poplar, with usually a dense undergrowth of brush. The summit is covered with *brulé* and considerable swamp, with patches of dense small spruce and tamarack of no commercial value.

The following remarks regarding game, minerals and climate will apply to all the country mentioned above. Game, including moose, caribou and deer, is very plentiful; east of the second meridian caribou are especially numerous. The moose appear to live in the Pasquia hills in summer, and are not often seen on the lower land until the snow in winter drives them out of the hills. Mink were seen on the Overflowing, Waskwei and Pasquia rivers, and traces of lynx were in evidence, though they are not plentiful. Muskrats do not appear to flourish here. Bears are very numerous in the Pasquia hills, and rabbits and grouse abound. Timber wolves are fairly plentiful.

A salt spring, the water of which was decidedly saline, was found flowing freely in March in range 28 on the thirteenth base east of the second meridian. Salt springs, I am told, are of common occurrence in this country, but, with the exception of these, no traces of minerals were found.

Except for a large meadow south of the thirteenth base line in range 2, west of the second meridian, there is little likelihood that horse feed of anything approaching first-class quality is to be found. No meadows were seen on the Pasquia hills, and the country as a whole seems particularly devoid of grasses.

The winter of 1912 was considered a severe one throughout the West. During February our thermometer registered as low as 38 below zero, and snow to a depth of two or two and a half feet covered the ground, but the snowfall in February and March was very light. Bright, cold days succeeded one another until April 1, when there was a decided rise in temperature and spring commenced at once. Although living in tents we did not feel the cold severe, and no time was lost to the survey work during February and March on account of stormy or excessively cold weather. Night frosts continued throughout April and May, and the last frost noticed occurred on the night of June 5. A severe snow-storm commenced on April 27, and snow to a depth of eight inches fell in range 2 on the thirteenth base west of the second meridian. The temperature then began to rise and rain continued every day until May 7. The country was flooded on all sides, and severe washouts occurred on the railway. There was no sign of spring growth on the Pasquia hills until May 28, but when work in this locality was brought to a close on June 14, the weather was decidedly hot.

## SURVEY OF THE TENTH BASE LINE WEST OF THE PRINCIPAL MERIDIAN.

The party moved to Winnipegosis on June 15, 1912, and after a short delay, owing to a storm on the lake, we sailed from there across lake Winnipegosis, and up Waterhen river to Waterhen lake.



The boats were first taken north on Waterhen lake, to where it was expected that the tenth base would strike the lake shore. Our provisions were unloaded there and five men were left with instructions to move supplies east as far as possible, as soon as the pack horses which had been sent overland around the lakes arrived.

With the remainder of the party and sufficient supplies, we then sailed south to the intersection of the ninth base line with the more easterly of the two Waterhen rivers. These rivers, one of which flows north from lake Winnipegosis to Waterhen lake and the other south from Waterhen lake to lake Manitoba, are almost parallel, and only a few miles apart.

Our horses arrived on June 21, and twelve were sent north at once to move our provisions east, while twelve were retained for transport along the block outline leading up to the tenth base. Work was commenced on June 22 and continued without serious delay until the base line was completed on November 5.

We found on starting our work that Mr. P. E. Palmer, D.L.S., had, as part of his contract, already surveyed the eastern boundary of township 33, range 15. This work was retraced according to instructions and new surveys commenced at the northeast corner of section 36, township 33, range 15, west of the principal meridian. The work then proceeded without delay until the northeast corner of township 36, range 15, was reached on July 5.

There, I was disappointed to find that efforts to move our provisions east, along the supposed course of the tenth base had not been successful. Floating bogs on which it was impossible to take the horses seemed to stretch in all directions.

As long as our work had led us in a northerly direction, the bogs, which are characteristic of this whole country, had not hindered our progress, because running, as they did, almost due north and south, good trails could be found on open ground along their edges. When our work turned east and west, however, it was quite a different proposition to transport supplies. Merely extending the survey was a comparatively easy task.

Before setting to work to cross these bogs with our supplies, I decided to make an exploration easterly to find what likelihood there was of being able to go forward with the base, provided the bogs we were in could be crossed. With Mr. C. J. Harper, one of my assistants, I travelled about fifteen miles east, and found the country steadily improving from a transportation standpoint.

The only good farming land seen during the summer is situated at the commencement of our work. Portions of townships 33, 34, 35 and 36, range 15, offer a few splendid locations for settlers. The more easterly of the Waterhen rivers seems to drain this range fairly well and offers an excellent means of drainage for the parts still wet. The wild grasses in this locality were of nutritious quality, and the soil generally placed this range in a class by itself from an agricultural standpoint. East of the easterly limits of range 15, in the townships mentioned above, floating bogs occupied large areas and for the more southerly of these I am doubtful if there are drainage facilities to lake Manitoba.

The country along the tenth base line as far east as range 10, is a regular succession of floating bogs, in which there was considerable open water and ridges.

The ridges in range 14 are generally suited to agriculture, but in summer they are practically inaccessible. The soil on these ridges is of fair quality, but after this range is passed the ridges are very stony. Our levels show a decided western slope to the land and the bogs no doubt could be drained. It has been the experience of farmers, who have drained similar bogs, that they make excellent farming land. The depth of these varies greatly; in some of them midway between the bordering ridges I found a solid clay, carrying boulders at four feet deep, while in others a pole sixteen feet long could be pushed down easily and at this depth no bottom was reached. The notes of our survey give no idea of the area occupied by these bogs, as they lie almost north and south. I would roughly estimate that they constitute from 60 to 75 per cent of the whole country.





Photo by J. R. Akins D.L.S.  
Camp in Tp. 96, R. 17, west of the Fifth Meridian.



Photo by J. S. Galletly, D.L.S.  
Pack Trail in Tp. 109, R. 15, west of the Fifth Meridian.







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The ridges in range 14 were wooded with merchantable spruce, poplar and birch. In ranges 13, 12, 11 and 10 the predominating timber is jackpine, spruce and tamarack of no commercial value. I did not see even tie timber from range 13 to Warpath river in range 7. After range 10 was passed the jackpine entirely disappeared, so also did the ridges, and the country became almost impassable.

In ranges 9, 8, 7 and 6 moss covers the ground to a depth ranging from two to four feet. The bogs, unlike those in the previous ranges which are generally open, are wooded with stunted tamarack.

On all sides small lakes were seen, and a slight pressure on the moss will show water at the surface. It was very difficult to find sufficient solid ground in range 8 on which to camp. The whole range, as well as ranges 9 and 7, had to be corduroyed in order to get our horses to the banks of Warpath river, in range 7. Ranges 9 and 8 are wooded with spruce and tamarack only, and these too small to be of value.

On reaching Warpath river on September 17, our horses were turned loose to feed along the banks. This grass was the only horse feed of anything like good quality we had been able to get since leaving range 14. After feeding on this grass for three weeks three horses died, and little improvement could be noticed in the condition of our remaining horses on November 4 when we came out.

Throughout ranges 7, 6 and 5 man-packing was resorted to, and the line carried through to lake Winnipeg.

Between the river in range 7 and lake Winnipeg there lies a large tamarack swamp, streaked with floating bog. The tamarack are large, and would be suitable for ties.

After the completion of the base to lake Winnipeg, a return was made to Warpath river, where my cook outfit had been stationed while supplying provisions for the work in the last two ranges. It was decided to take advantage of the means of transportation afforded by this river to run the block outlines between the ninth and tenth bases. The camp outfit was moved in boats up the river and camps established on the bank. This necessitated rather long walks to the work sometimes but the condition of our horses rendered their further use impossible.

The survey of the easterly outlines of townships 36 and 35, in range 8, disclosed no better land for farming. Swamp, bog and moss were continuous, and the spruce and tamarack back from the river bank still continued small and of no commercial value.

At the ninth correction line the bulk of the camp was left and man-packing again used to run the east outline of township 34, range 8, north. This six miles followed a dry, jackpine ridge, the trees ranging from six to eighteen inches in diameter and growing thickly. About two miles west of this line we found about two square miles of excellent spruce and tamarack. This lies approximately in sections 10, 11, 14 and 15 of township 34, range 8. The soil on the ridge is light and sandy, but west of that, in the spruce, it is good.

One of the striking features of this whole country is the absence of creeks and rivers. Not until we reached Warpath river, in range 7, did we cross a river or even a creek, but on one or two bogs I noticed that water was flowing quite rapidly through the grass over the whole surface of the bog. Often, on going a second time over our horse trails in the moss, we found the water flowing freely down the trail. When Warpath river was reached, we were surprised to find that although this river, sixty feet wide, flowed with a current of from three to three and one-half miles per hour, it did not seem to have any drainage effects on the country through which it passes, the bogs extending almost to the river. No doubt the depth of moss prevents the water from gaining an outlet.

We had an opportunity, during the summer, to see the enemy of the tamarack trees hard at work. Thousands of these short green worms were to be found feeding on the needles of the tamarack and they entirely stripped the trees of their foliage.



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One could not walk among these trees without being covered with the little grubs. No tamarack, however isolated, seemed to be escaping this scourge, and what is more peculiar still, no other variety of tree was affected.

Regarding game, I may say moose and caribou are very plentiful, these animals being seen almost daily. Traces of lynx were fairly plentiful, and mink, otter and muskrat were numerous on Warpath river, but only a few traces of bears were seen. Rabbits and grouse are particularly plentiful. Jackfish were abundant in Warpath river.

During the latter part of June and the first part of July, the heat was intense and no summer frosts were noticed. The lakes were open until November 5. The first frost occurred on September 14 and 15, when thin ice formed on the standing water in the swamps.

Notwithstanding the large gypsum deposits north of the ninth base, no trace of this or any other material was seen on our work.

On November 5 we commenced our journey to Gypsumville. It had been thought that we could take our outfit up Warpath river to Gypsum lake and thence to Gypsumville, as maps of this country show the river flowing out of Gypsum lake. The main Warpath river does not, however, rise in Gypsum lake, but in Pine lake, some distance west and north of Gypsum lake. Moreover, there is no continuous waterway from Gypsum lake to Warpath river, and we were forced to take our camp across the portage, which is a large floating bog, to Dauphin river and up the Dauphin to lake St. Martin. This lake we found frozen over at the source of the Dauphin and we had to man-pack our belongings to where a yoke of oxen could reach them and take them to Lake St. Martin Indian reserve. The country was in a very wet condition after the unusually wet summer and it was November 18 before the camp equipments reached Gypsumville.

#### SURVEY OF THE ELEVENTH AND TWELFTH BASE LINES WEST OF THE PRINCIPAL MERIDIAN.

We left Chemong on December 16, 1912, for Fishtown siding, near Novra station on the Canadian Northern railway. A few days were required to open up the old sleigh road, which leads easterly from Fishtown to the Swan Lake Indian reserve. Supplies and equipment were soon placed in range 24 and survey work commenced at the quarter post on the north boundary of section 36, township 40, range 25, west of the principal meridian, on December 28.

In range 24, some very good farming land was crossed. This land is wooded fairly heavily in section 31 and 32. Wood river, a stream 100 feet wide, with well defined banks and flowing north through the Swan Lake Indian reserve to Swan lake, was crossed in section 32. Section 33 and fractional section 34 are low-lying meadow land. The Indians on Swan Lake reserve report that previous to the summer of 1912, they were able to cut hay on all this land but during this exceptionally wet season they were unable to harvest hay excepting on land near Swan lake.

In section 34, Swan lake was reached. This lake is very shallow, and freezes almost to the bottom. Fishing is carried on by the Indians on Swan river, the mouth of which was crossed in section 31, range 23. No fishing appears to be done on the lake, and only jackfish and pickerel are caught in the river no whitefish being found there.

Having crossed the lake we saw some excellent farming land in sections 31, 32, 33 and 34 in range 22. This belt of good land extends along almost the entire easterly shore of Swan lake. This country, of course, is heavily wooded but the soil is of excellent quality and in section 32 the land lies fifty feet above Swan lake. In section 35 the land drops considerably and a large area of swampy country covered with deep moss and wooded for the most part with scrub, spruce and tamarack, extends far north and south of the base. The description of the base line through section 36, range 22, and sections 31, 32, 33 and 34 of range 21, cannot be taken as a fair indication of the nature of the country in general. The line there approaches Pelican lake, and running for some distance through country immediately south of the lake, passes through land heavily timbered with excellent spruce, poplar, birch and tamarack, and presents some good locations for settlers. Large meadows extend south from Pelican lake



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through sections 33 and 34, range 21. There is, I think, no doubt that a considerable portion of these could be cropped.

Creeks were crossed in sections 32 and 33, range 21, flowing north to Pelican lake, but the water in these was decidedly saline.

My ranger reported that north and south of the base in range 21, the country from an agricultural standpoint is far inferior to that described in the field notes of the survey. North of the base, small spruce and tamarack are found in all directions, with an almost continuous scattering of small jackpine. Open grassy stretches were occasionally met, which, from his description, I expect were floating bogs. South of the base the country was more promising, larger areas of spruce and poplar being found.

In section 34 the west shore of Pelican lake was reached. This lake is a much larger body of water than the maps of this district indicate. It measured over five miles in width, where the base crossed it and extends southeast to within two miles of lake Winnipegosis. It appears to be as large as Swan lake.

The country between Pelican lake, in range 20, and lake Winnipegosis, in range 18, is, for the most part, swampy, though apparently not nearly so wet as the country along the Pas branch of the Canadian Northern railway. In range 19, the land becomes more rolling and poplar ridges were crossed in section 35. I think this country might be developed into fair agricultural land. Lying under the moss and muck is a sandy clay, carrying limestone boulders. This limestone lies within eight inches of the surface in section 36, township 40, range 19.

The country is principally covered with spruce, tamarack and occasional jackpine. Brulé covers the surface in range 19. A considerable spruce forest once flourished in this range, but fire has completely destroyed it.

With range 18, the country again becomes a swamp, wooded as before with scrub spruce and tamarack, until the usual narrow strip of high land bordering lake Winnipegosis is reached in section 32.

With the exception of Birch island, no more land was crossed on this base. This island, lying in sections 35 and 36 of range 18, and sections 31, 32 and 33 of range 17, contains a limited amount of good agricultural land. It is wooded with small poplar, birch, spruce and tamarack and for some distance in the centre of the island, the land becomes swampy, but this could be easily drained.

Having crossed lake Winnipegosis, the base was carried to the northeast corner of section 36 in range 16. East of lake Winnipegosis, the land along the base was very swampy, small lakes being numerous. High land is found south at a distance of about five miles but north the usual swamp, characteristic of this country, stretches far and wide.

By February 21, 1913, the work was completed on the eleventh base and the party started at once for the twelfth base line in township 44, range 25, west of the principal meridian.

The return was made along our own trail on the eleventh base, as far as Swan lake in range 23. The party was then taken north on Swan lake and Shoal river to the Armstrong Trading Company's post on Dawson bay. There advantage was taken of the winter road between Pelican Rapids post-office and Mafeking as far as Steeprock stopping place where we found ourselves, on March 3, only a few miles south of our point of commencement on the twelfth base line.

Acting on your instructions, a retracement survey was made on the north boundary of township 44, range 25, and new surveys commenced on the twelfth base in range 24, on March 10.

Throughout ranges 25 and 24 our surveys traversed a rolling country which, as we approached the shore of Dawson bay in section 31, range 24, was fairly heavily wooded. In the valleys the country is generally of a swampy nature, but, with proper drainage, it could no doubt be utilized for agriculture. The higher land is wooded with spruce, tamarack, poplar, birch and balsam. Generally speaking, the timber is



as yet too small to be of value for lumber, but some trees close to the lake, in range 24, measured as large as twenty-four inches in diameter. The soil in range 24 consists of clay, carrying limestone boulders, and outcrops of limestone rock are frequent all along the lake shore.

The easterly shore of Dawson bay was reached in section 32, range 22, the base having crossed narrow points in sections 35 and 36 of range 23, and section 31 of range 22. These points form part of Indian reserve No. 65 B.

Surrounding Dawson bay south of the base in ranges 24 and 23 there is a strip of land from one to two miles in width, wooded very heavily in places with spruce, tamarack, birch and poplar up to twenty-four inches in diameter. This, when cleared, would afford some excellent locations for settlers. In fact, from our explorations through the whole country adjacent to the eleventh and twelfth base lines, it may be fairly well described by saying that contiguous to the lakes there is always to be found a belt of high land which when cleared would make good farming land. Back from the lakes, one, two or at most three miles, the country either remains a mossy swamp or, what is worse, a floating mass of decaying vegetation.

In ranges 22 and 21, the base crossed the point of land separating Dawson and Pelican bays. Here again we found, on either side of the point, fairly high gently-rolling land, well wooded with spruce, birch, poplar and tamarack and adapted for agriculture, while the intermediate land still remains a mossy swamp wooded with stunted spruce and tamarack.

The only other land touched by the base, as far as we surveyed it, lies on the narrow point separating Pelican bay from the main Winnipegosis lake. This land lies in sections 33, 34, 35 and 36 of range 20, and sections 31 and 32 of range 19.

Owing to the narrowness of this point, practically all the country traversed by the base line and north of it is fit for agriculture, but south, where the point is wider, the muskeg is found, as usual.

The soil on the high ground consists of clay loam with limestone gravel or boulders. The swamp land is covered with moss, under which lies a layer of about one to two feet of black muck. The subsoil is clay carrying limestone boulders. Outcrops of stratified limestone are frequent on the lake shore and on points running into the lake.

The survey of this base was completed to the northeast corner of section 33 in range 16, on April 3, and the return journey to Mafeking station was commenced at once. We returned by our own trail along the base line as far as Whiskey Jack point. There we reached the winter road which leads to Mafeking via Pelican Rapids post-office. The party reached the railway on April 8.

During the winter of 1912 and 1913, some intensely cold weather was experienced, especially from January 4 to February 14, the thermometer registering as low as 60 below zero on January 19, 20 and 21. Seldom during this period did the temperature rise above 20 below zero. With the exception of this cold spell, however, the weather was very favourable for survey work. In fact only three days were lost during the entire winter owing to the excessive cold. The snowfall was not heavy, there being at no time more than two feet of snow on the level. Snowshoes were seldom used. The fall of 1912 was exceptionally fine, no cold weather being experienced until late in December. By April 8 the snow had almost entirely disappeared, and spring opened at once.

Winter fishing was carried on by the Indians and white settlers on lake Winnipegosis during the entire winter. Whitefish, pickerel and jackfish are caught there in large numbers. Fishing and trapping afford ample winter work for settlers in this locality.

Game, including moose and deer, is very plentiful. The moose live in the Porcupine mountain in summer. In winter they are to be seen daily throughout the country traversed by the eleventh and twelfth base lines. Rabbits and grouse are



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numerous and during the past winter many beavies of the white grouse or ptarmigan were seen. Muskrats, mink, lynx and otter are also fairly plentiful throughout this country. Timber wolves are rarely seen now, but large numbers of brush wolves are still to be found on the lakes in winter feeding on the piles of fish offal left by the fishermen. These animals are said by trappers to be slightly larger than the prairie wolves, but they do not travel in packs and appear very cowardly.

On the completion of this work the party was paid off at Mafeking on April 10.



## APPENDIX No. 41.

## ABSTRACT OF THE REPORT OF R. C. PURSER, D.L.S.

## MISCELLANEOUS SURVEYS IN SOUTHERN SASKATCHEWAN AND ALBERTA.

The work on which I was engaged during the season of 1912 consisted of small scattered surveys in the provinces of Saskatchewan and Alberta.

My first important survey was the extension of section lines on the dry bed of Goose lake in township 32, range 10, west of the third meridian. This work was commenced by Mr. W. A. Scott, D.L.S., in December, 1911, but cold weather prevented its completion at that time. The banks of this lake are from five to twenty feet high and the bottom is a great and almost level stretch of clay soil. With the breaking up of the surrounding prairie, the water has all disappeared, leaving a perfectly dry expanse that is gradually becoming covered with vegetation which is growing out from the old banks towards the centre. No doubt in time the whole flat will be one large stretch of prairie, hay and farming land.

In township 39, range 1, west of the third meridian, two sets of duplicate monuments along the south boundary were noted. No information could be obtained from the residents as to which were the correct monuments and no explanation could be made as to the cause of their existence. Fourteen miles of line were retraced in an endeavour to determine the correct line. All appeared to be in the same state of preservation and no pair of monuments corresponded with the measurements given on the plan. The correction of these duplicate monuments thus resolved itself into the selection of those monuments which would give the most equitable portion to all the quarter sections involved. These were selected and renewed and the others were destroyed.

In township 39, range 13, west of the third meridian, the monuments had been reported lost, and an examination was made to determine if the survey was necessary. It was found that a resurvey was urgently required. This district is reached by good trails from either Maymont or Radisson on the Canadian Northern railway and then by a ferry across Saskatchewan river. The township, being in the midst of the Eagle hills, is rather rough and is, for the most part, covered with a heavy growth of poplar and balm of Gilead. A luxuriant growth of pea-vine and wild flowers cover the best portions to a height of three or four feet. A large number of the original monuments in this township could not be found, and this fact has seriously hindered the taking up of the land by homesteaders. An attempt had been made by some of them to lay off their quarter sections by compass lines. The few settlers at present in this township are obtaining good crops. Scarcely any trails except winter roads lead into the dense growth in the central portion of the township. To drive farther west one must make a detour either to the north or south over circuitous trails.

A traverse of part of the east bank of South Saskatchewan river in township 33, range 6, west of the third meridian, proved very arduous work for a travelling party of two persons. Commencing at the intersection of the north boundary of section 24 with the river bank, I traversed the shore northward to the north boundary of the township. This was necessarily through thick bluffs of poplar and alder along the top of the river bank, it being impossible to use the beach on account of its narrow and winding nature. Formerly the main body of the river flowed along the west shore, but recently changes have occurred and now the current runs swiftly along the east bank where it has already, by a gradual erosion of the sandy soil, worn away several acres from some quarter sections. Two islands were surveyed; the larger one, con-



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taining roughly about three hundred and fifty acres in township 33, range 6, west of the third meridian, has virtually become part of the mainland due, probably, to changes in the river level since the original survey. A channel less than one chain wide separated the island from the river bank. At present this old channel still exists but it requires a rise of four feet from the average level of the river to send any water through it. This island is of little value for agricultural purposes at present as the soil is light and the surface is thickly wooded. Evidences are also present showing that within recent years the whole island has been inundated by the waters of the river.

In township 49, range 6, west of the third meridian, several lakes were traversed which had been missed by the original subdivider; one of these was about four hundred and twenty acres in extent and was reported to be over one hundred feet in depth.

Many other small surveys besides those above noted were made.

The progress of the season's work was hampered somewhat by the very wet weather that prevailed during the summer months.



## APPENDIX No. 42.

## ABSTRACT OF THE REPORT OF C. RINFRET, D.L.S.

## MISCELLANEOUS RESURVEYS IN SOUTHERN SASKATCHEWAN.

I organized my party at Moosejaw and, on June 5, 1912, left for my first work which consisted of investigating duplicate monuments in five townships southeast of Moosejaw. A second subdivision of these townships were made in 1883 and the then existing monuments were not all destroyed. All the land in these townships was taken up long ago, and most of it is now under cultivation.

The next work, which was reached on June 29, consisted in surveying the dried-up portion of the bed of Johnston lake, southwest of Moosejaw. This portion is an alkaline flat yielding abundant hay of second-class quality, and covers an area of about six square miles. Township 14, range 29, on the north side of the lake has sandy loam soil, and although very rolling in the north it is rapidly being taken up by homesteaders. The north third seems best adapted for ranching.

Having completed this work, we proceeded by trail to some townships northeast of Maple Creek which were to be resurveyed, arriving there on August 22.

Townships 14, ranges 23 and 24, west of the third meridian, consist for the most part of sand hills covered with shrub and are at best only suitable for ranching, hay being found in places and good water being easily obtained.

A strip of good loam soil, fairly level and about four miles wide covers the northern part of townships 15, ranges 23 and 24, beginning near Bigstick lake and stretching eastward, but the south third consists of sand hills and is useless. In township 15, range 23, oats and wheat grow splendidly, and the township is being well settled. Most of township 15, range 24, is leased to ranchers, although there are a few good homesteads still available.

In this district the settlers complain of the lack of herd law, as cattle and horses are allowed to roam at will, damaging the crops of those who have not the means of fencing up their land.

The north third of township 13, range 25 has a good soil but it is very rolling and would be best suited for ranching.

The whole of township 15, range 26, has good soil and is fairly level. It is now all taken up and partly cultivated by numerous German settlers. Two years ago not a shack could be seen for miles around.

Having completed the survey of this township I disbanded my party on October 18, after which, with my assistant, I proceeded to make a few miscellaneous surveys.

I corrected wrongly-placed monuments in townships 14, ranges 1 and 10, and also in township 32 range 26, all west of the third meridian. This necessitated driving, and travelling by rail.

My next work was to survey those parts of the townships bordering the Quill lakes which had dried up since the original subdivision. These lakes had not dried up to any noticeable extent except in townships 32, ranges 17 and 18, and township 33, range 18, west of the third meridian, where a few square miles required subdivision. I also surveyed a few lines in township 34, range 16.

The land recently dried up consists mostly of an alkaline flat, swampy in places, and not much good for farming. It yields plenty of fairly good hay, but only one crop every other year.

Some changes were also found in township 34, range 14, and township 35, range 17. In the latter township the lake is larger than on the original plan, but as there were no farmers living in that vicinity we were unable to get board, and the survey could not be conveniently done at that time. Therefore, after completing the inspection of all the other townships bordering the lakes, I closed operations for the season on December 12.



## APPENDIX No. 43.

## ABSTRACT OF THE REPORT OF A. SAINT CYR, D.L.S.

## SURVEY OF PART OF THE EIGHTEENTH BASE LINE WEST OF THE THIRD MERIDIAN.

On February 21, 1912, with four loaded teams of my own and four others hired from Mr. W. C. McKay, we left Big River, where my supplies and outfit had been shipped by rail, for Doré lake. On this trip we took the new Isle à la Crosse winter road and, after crossing the portage between the south end of Cowan lake and lac DeLaronde, we travelled the whole length of the last-mentioned lake. We then crossed another portage to Sled lake, where there is a small settlement near its north shore. Here travellers are always pretty sure to find lodgings and also feed and stabling for their horses at the home of an enterprising fur trader who took up land ten years ago and has since cultivated part of it, raising oats, barley and vegetables.

Good hay in quantities can also be procured from meadows not very far distant from the settlement, and this should be an inducement to any rancher looking for a suitable location.

From Sled lake, the winter road runs through a flat and sparsely wooded country which extends to a deep but narrow bay at the south shore of Doré lake; this bay opens out in the lake five miles north of the place where the overland route ends, and at the north extremity of the high headland which closes this bay to the west, is now located one of the company's fishing stations, which we reached on the night of February 24.

On February 28, we arrived at a point on the northeasterly shore of Doré lake where it was decided to build a cache. The hired freighters left us here and returned to the fishing station.

I discovered an old road leading to lac La Plonge, and while my men were at work building the cache I blazed this road anew for several miles, so that the packers would have no trouble following it when going to the cache for supplies later on. A rough compass survey of the west half of Doré lake was also made from this camp.

On March 4, I joined my men who had finished the cache and the next day we began our return journey, arriving at Big River four days later. On March 9, I sent my teams by the overland route to Montreal lake, while I returned by train to Prince Albert.

The following days I spent in preparations for the trip to Montreal lake. Freighters had been so difficult to get that several loads of my supplies which the Hudson's Bay Company had agreed to forward for me were still in their warehouse at Goschen.

On March 27, my party proceeded to Montreal lake, while I remained in Prince Albert, expecting daily to get my large transit which had been sent to England for repairs.

On March 30, no word having yet reached me of the early delivery of this instrument, I made arrangements to have it forwarded to me as soon as it arrived, and proceeded north by way of Montreal road. On April 2, I caught up to my party which had just arrived at the north end of Montreal lake.

Five miles west of the lake shore, our road crossed Weyakwin river, over which it was necessary to throw a bridge one hundred feet long, as the ice had already been broken by the force of the current. The numerous large boulders which obstruct this part of the river helped materially to support and hold securely in place the bridge timbers which otherwise could not have stood the pressure of the drifting ice and of the rising waters of this turbulent stream.



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From Weyakwin river the road was opened four and one-half miles farther west to the shore of Weyakwin lake, over which we had to travel on ice six miles north before coming to a stream, the general course of which is northwest. The ice here was showing signs of giving way in many places so that after the freighters had dumped their loads on the banks of the river they refused to help us any farther, and I had to pay them off.

After their departure my teamsters made repeated trips between the river and the cache which some of my men were building, while others were continuing the sled road northwards to our next camping ground.

On April 13, we began the survey of the third meridian at the northeast corner of township 64.

Proceeding north of the seventeenth base line our surveys were at first carried through a hilly section of burnt country where large areas covered over with decaying fallen timber intervene with woodlands; but the trees, such as the banksian pine, spruce, poplar and birch are too small to be of any commercial value. Much brushy land which could be easily cleared was also noticed; the soil is clay loam, but it is inclined to be stony; the land is less so in the north half of township 65 where the soil consists of sandy loam.

In section 25, the meridian intersects a valley bordered on its north side by a wide strip of timber, where the trees measure up to ten inches in diameter. The general direction of this valley is northeast and its bottom lands include a few small hay meadows drained by a stream rising in tamarack swamps which extend far west of the meridian.

The slopes of the hills south of this valley and some of the wide ravines that lead to its bottom are generally denuded of timber or brush, and I noted that where the snow had melted away the hillsides were covered with dry grasses and pea-vine. It is therefore possible that during the summer months this section would afford fair pasturage for a few head of cattle. Eastward these hills slope down to Two Forks river, whose valley runs parallel to that of Montreal river.

In township 66 the surface is more regular. From the east outline the land rises gradually to a low divide, located three miles farther west, and beyond which all the streams flow north. This tract of country is very stony and wooded with banksian pine from four to ten inches and spruce four to six inches while on the top of the hills which rise west of it, poplar six to ten inches in diameter grow. The low lands which surround these hills are strewn with deadfall which makes travel very arduous. In this vicinity there is a lake and several large swamps. South of these the surface is light and rolling and covered with second growth timber. Northwards is a range of high hills close on to the north boundary of this township.

West of the divide, several deep creeks intersect the meridian. They are the headwaters of Twoforks river. Owing to the season, when our surveys were made, each of these streams crossed by our road was overflowing its banks, consequently we had to build bridges over them. To expedite this work we often utilized the beaver dams as a support for the timbers, when suitable logs were scarce or would have had to be hauled from too great a distance. For crossing the widest streams large rafts, strongly bolted, were used.

The streams were not by any means the only daily obstacles to our progress, for mile after mile of boggy ground, too soft to bear the weight of the loaded pack ponies, had to be corduroyed or brushed. Unlike the bridges, these brushed roads required constant repairs till the whole camp outfit and supplies, which amounted to several tons, had been carried over them.

These muskegs and swampy lands extend to the correction line. Then comes six miles of undulating country with drier, although very stony land, drained by the river which now turns to a northwesterly course and crosses the meridian in section 25, township 67. At intervals in the valley of Twoforks river, the timber cruiser reports having seen bluffs of spruce trees averaging twenty inches in diameter.



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Starting from the corner of section 12, we travelled west through pine woods on the north side of the valley, varying from a quarter to half a mile in width. On its bottom grow dense willows and alders amongst which meanders a stream flowing east. The south side of the valley is also wooded, but the land is more broken by ridges. At one mile and a half from the meridian I came to a rapid; here the valley is only a few chains wide and the pine forest reaches almost to the creek. The trees are of a good growth. Above the rapids another valley from the south meets the one I was following, and through it flows probably the same stream I had crossed farther south in a previous exploration. Beyond the junction of these streams the pine ridges to the north gradually descend to the level of a low tract of land. The main stream now turns toward the southwest, and soon divides into several small branches. After travelling west for several hours through a wet and mossy section, with tamarack and spruce from six to eighteen inches, I returned to the line by way of section 1, where I crossed a ten-acre patch of spruce from six to twelve inches and balsam six to ten inches in diameter.

One mile north of Twoforks river the country is also low, but as we enter township 68 from the south the ground rises again and banksian pine up to ten inches is the most common timber. The surface becomes more even from there on to section twenty-four but the ordinary features of stony land and scrubby timber recur. Half a mile west of the east boundary of section 12, township 68, is a hay meadow covering about two hundred acres. In section 13 the line crosses another stream flowing northwest, and with some wild hay growing along its banks. Beyond, are large bogs separated by narrow strips of higher ground; these spread to the eighteenth base line. In these grow spruce, tamarack and birch of inferior quality.

North of the base line, the explorer reports the same conditions to prevail as far as a creek, the outlet of a large lake located at three miles east of the township corner. Beyond the creek the land is better drained and supports a good growth of pine and spruce.

From section 25, township 68, we cut a trail to Montreal rapids, a distance of nearly eight miles. This road was needed for bringing to camp our mail and supplies from Montreal lake.

From the right bank of Montreal river the trail was continued to Montreal portage a further distance of one mile and a half; by following this portage two miles and a half, we arrived at the head of the rapids. On the point formed by an elbow of Montreal river at the rapids, is a strip of spruce of good quality and size and suitable for lumber. Poplar up to eight inches is also found in patches surrounded by fire-killed timber. Where our trail strikes the rapids, Montreal river is seventy-five yards wide, its banks at this point being very low.

East from the corner of township 68, there is a low section of country supporting a poor growth of spruce and tamarack. High land is found only as we approach a lake nearly five miles long and surrounded by poplar and pine woods where the timber runs up to ten inches in diameter.

After crossing two small brooks which enter the south end of this lake, swamps intersected by a few low ridges are again met; they spread east to the river banks at Montreal rapids.

Explorations conducted farther south, across township 67, ranges 26 and 27, west of the second meridian, showed that the country there was very boggy and that the only dry land consisted in a strip about two miles wide along the left bank of Montreal river. The soil is a clay loam, apparently free from stones; poplar, pine and birch are the trees which grow in this vicinity. Throughout the country adjacent to the third meridian there is practically no grazing land except along the edges of a few streams, where scanty grass of the coarsest variety grows on land so quaky or imperfectly drained that horses did not dare to venture on it. The cause of this excess of water is due partly to the dams which the beavers have built at short intervals along the streams.



## EIGHTEENTH BASE LINE.

The north boundary of township 68, range 1, runs through continuous spruce or tamarack swamps and open marshes lying along the foot of a range of hills north of Twoforks river, which flows in a northwesterly direction across the township.

These swamps extend as far as the river in section 25, township 68, range 2. Here its banks are twelve feet high and fringed with willows, back of which is a strip of large spruce trees measuring up to thirty-six inches.

In section 32 another important stream also intersects the base line, and meets Twoforks river three miles farther on. Between these rivers the land is almost level, and better drained. It is stony and covered with scrub; the soil is light. As the open land adjoining this stream was the only place where grass grew, the horses had to be held in this vicinity till we had found new pastures farther west. All our stores were also kept there for a considerable period, small quantities only being brought to the main camp as they were required.

One of our ponies mysteriously disappeared from the camp, and although a diligent search was made for him during several days, no trace of his whereabouts could ever be found.

The surface of township 68, range 3, is broken, but more so in the south half of township 69 where rises a succession of sandy hills almost denuded of vegetation. North of these is a wide depression, with a large lake discharging by an outlet a mile and a half long and seventy yards wide into Twoforks river. Along its north shore the land is level and sparsely timbered for two miles, when the ground rises gradually to wooded hills in the centre of township 70. South of the base line, the country is rolling and dotted with numerous lakes of varying sizes. The land is generally well wooded, although the timber is not very large. The soil consists of clay loam, eight inches deep; the subsoil is sand.

In range 4 we came to the valley of Smoothstone river, the outlet of Smoothstone lake which lies twelve miles south of the base line, and is one of the largest bodies of water in this district. This river first crosses the line in section 31, thence its course is nearly east for three miles, when it divides into several channels, with hardly any perceptible current. The principal one turns south across the line in section 31 and soon after discharges into a lake which covers nearly all of section 34.

Up to the place where the river divides, its valley is well defined by high hills which extend southwesterly along its course to the rapids where they slope down to benches fifty feet high. Farther south these benches merge with the level country along the north shores of Smoothstone lake. The navigation of this stream, which is frequented by the natives from Snake lake, is feasible by canoes for a distance of four miles south of the line where the rapids begin. They are reported to extend without interruption to the place where the river flows out of the lake.

In the other direction, as far as the large lake that covers a large area of townships 69 ranges 3 and 4 there are no rapids; in the narrowest stretches of river the channel is quite deep and the current slack. Along this route, Smoothstone river often expands into lakes with shallow bays, the favourite haunts of ducks, which were in great numbers at the time of our exploration.

On July 6, I left my camp on Smoothstone river, near the corner of township 68, range 5, to explore the country between the base line and Smoothstone lake. On this trip I was accompanied by the timber cruiser, and we used the canvas boats, intending to travel by water eight or ten miles, and then establish a camp from which our explorations would cover ground which might have been inaccessible if these had been carried on from the line, but we had not travelled more than four or five miles from the main camp before we came to the foot of bad rapids. On the way we had passed a bend where the river bifurcates; one branch, almost blocked up with jammed drift wood near its head makes a long detour to the east, but joins the main river again a mile and a half farther down, forming the only large island seen in



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this part of its course. Along the left bank are a few large spruce, and small patches of the same timber grow half a mile farther west.

The banks of this river are seldom over five feet high and are grassy, or covered with willow, except near the rapids, where the woods extend to the water's edge; the current is very variable.

The basin drained by Smoothstone river must be very great, for I noticed that after a few hours of steady rain the water rises very fast and is liable to overflow the banks of the river.

Fearing to tear our canvas boat on the jagged rocks which obstruct the river, we decided to go afoot along the river bank and to ascertain the length of these rapids. After travelling for several hours, sometimes on pine flats, but mostly through dense willows, and seeing no slack water, we returned to the place where our boat had been left and prepared camp for the night.

The next morning the timber cruiser paddled across the river and started in a southerly direction, whilst I went on a course that would allow me to explore a strip of country three or four miles west of the river, after which I intended to turn southwesterly towards Smoothstone lake. When I had travelled for a quarter of a mile over a wooded flat I climbed a high bench on top of which are banksian pines, poplar and some birch. The country ahead was almost level, and although it was well drained in the first mile, owing to the proximity of the river, it gradually turned to marshy lands covered with decayed fallen timber, amongst which some wild hay grows. Farther on I crossed a small stream, tributary to the river, and continued my journey in tamarack, spruce and scrubby birch and thick willow over ground that was decidedly boggy. Towards the latter part of this day's explorations, I came to a much larger stream, flowing from the northwest, and to the right I could see many high hills. Then I struck southeast towards the valley of Smoothstone river which I approached through dense woods and extensive mossy swamps of tamarack and scrubby spruce. These extend to the river, where I could still hear the sound of the water rushing amongst the rocks. The natives must travel along this valley during the winter, at least, for I saw signs of their passage. The country east of the river is quite different to the section I had explored that day; it appears to be very hilly, although densely wooded. When I met my companion that night by the camp fire he was so wet from head to foot that I imagined he had attempted to cross some river. He reported having travelled over a rough country, and climbed up hill after hill with only bogs between them. When near the end of his day's journey, he had seen a large lake two miles farther on and southeast of the course he was making. On July 8 we returned to the line.

Beyond the high stony ground that defines the west of the valley of Smoothstone river, the surface of range 5 becomes more even, but one-third of this land is swamps, covered with scrub tamarack, spruce and birch, except along their edges, when the trees are somewhat larger.

Good timber is still found in patches south of the line, and consists of spruce from six to twenty-four inches, poplar from six to ten inches, and banksian pine from four to eight inches in diameter. The preservation of the timber in this locality is due to the numerous lakes, which are all connected with bogs. This has prevented further inroads of the forest fires in that direction. The soil consists of ten inches of clay loam overlying a subsoil of gravel.

Near range 6 we came to a high and broken country which continues for several miles along the east and north boundaries of township 69, range 6, leaving towards the south a sort of basin in which is a chain of lakes of varied sizes. From these hills spring many brooks discharging into these lakes, whose overflow forms a large creek which runs south in section 31, and carries to Smoothstone river the drainage of this section, and also part of the surplus water from the wet lands in the northern part of township 69, range 7, by a west tributary which empties into it in township 68, range 6.



From the report of the explorer who visited ranges 6 and 7, north of the base line, I note that he travelled close to the outline between ranges 6 and 7, passing first some scrubby land, and also a lake two miles long and from ten to sixty chains wide. He then ascended to the summit of high hills which are wooded with a fine growth of poplar measuring up to ten inches. This, however, is only a belt of large trees which runs northeast.

Continuing north, he soon arrived at a stretch of country which had been devastated by fires, and where large numbers of scorched trees were still standing. His progress was now much hindered by deadfall, but as the ground was dry and fairly level, he pushed on to the correction line, four miles farther, passing on the way a valley with a small stream, to which he returned to camp for the night. From this place he explored west, crossing in section 33, township 70, range 7, a stream running south. Near the corner of range 8 he ascended some high hills with banksian pines and small poplars. On the following day he proceeded three miles east through a burnt-over but flat country, after which he crossed another part of the same high poplar ridge which he had seen near the corner of township 69. This ridge continues north, but towards the east it slopes down to swamps and muskegs, which he also explored, meeting at intervals strips of spruce from ten to twenty inches in diameter, and saw several small streams, all flowing north. From the top of a tree he saw in that direction a great depression, which may be where Snake lake lies. He reports some high ground at five miles farther east on the correction line. This I had also noted when I was surveying in ranges 3 and 4.

The high and well defined poplar ridge above referred to would therefore be the division in the drainage to the basins of lac La Plonge, Snake lake, Doré lake and Smoothstone lake, which are all very large bodies of water.

In range 7 we encountered many swamps, separated by mossy ridges, but no grass of any kind, and for a while the ponies had to shift the best they could till we had arrived at range 8, when we discovered, between low ridges covered with deadfall, a small lake with a strip of coarse grass along its boggy shore.

In section 35 we entered a drier country with signs of a very recent fire, from which must have arisen the smoke which had previously interfered with my observations. Our cache of supplies was only a few miles south, and for a while I felt very anxious. I was therefore greatly relieved when the timber cruiser, whom I had sent to Doré lake, returned to camp with the news that this local fire had died out before reaching the shore of the lake where the cache was located. Northwards it had burned fiercely through some dry deadfalls and pine woods as far as the south edges of a muskeg, six or eight miles long, which extends in a northwesterly direction almost to lac La Plonge.

From section 35, in range 8, the line traverses the northern spurs of rough hills which extend south to Doré lake shore. Westward they cover nearly one-half of range 8 and almost all of range 9, when they descend to the low lands on which is located the new winter road opened by the Isle à la Crosse Fish company. This road is only seven miles long and connects Doré lake to lac La Plonge; the country between them is level, except when approaching lac La Plonge where it is hilly. At half-way between these lakes in another smaller one. This section is covered with tangled willow and scrub tamarack or spruce.

The portage over which the trappers used to travel between the above-mentioned large lakes intersects the base line at half a mile west of the corner of township 68, range 9. By this portage the distance between Doré lake and lac La Plonge cannot be less than twelve miles. It starts three-quarters of a mile east of the high escarpment on the north shore of Doré lake, and for about two miles it runs through a fairly level timbered country, following in places the shores of small lakes. Thence the land rises and the road crosses some high ridges, after which it descends again to a sort of pass between the hills where there is a continuous chain of small ponds, with some wild



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hay along their edges. After crossing the line it turns northeast to the divide, three miles farther on. This part of the trail is blown over with dry trees, and is difficult to follow. After crossing a small stream flowing towards lac La Plonge, it ascends to a plateau covered with scrub, which the explorer classified as very good soil. This plateau spreads four miles farther to the shores of lac La Plonge, where it descends abruptly.

The country west of the trappers' trail has been devastated by fires, but on the hills, east of it, grow large poplar and banksian pine. Fair-sized spruce was seen near a few of the small lakes and also in strips on the points of Doré lake and at different places along its shores, notably on some high ridges back of two small bays on the west shore. At three miles off this shore there is a very large island whose surface rises from the water's edge to the summit of a high hill which occupies its south half. Nine other islands of different areas and separated by narrow arms of the lake are scattered in a northeasterly direct between the largest one and the head land on the north shore.

Another group of islands lies in the south bay into which Sled river discharges, whilst a few more are also located in other bays or close to the shores. All these islands are timbered.

West of the fisherman's road which leads to lac La Plonge is a strip of undulating country which extends to the centre of range 10. From there on the surface is rough, but only for a short distance, as more level land appears again beyond the ridges. This part is generally swampy, but it was noticed that many of the swamps were nearly dry, indicating that the drainage which goes south to Doré river finds a better outlet from most of the low sections we had crossed so far. Tamarack from four to ten inches in diameter were seen in several places and is the only timber of any value; the rest consists of second-growth poplar, spruce, banksian pine and birch. The soil is poor, being composed of sand, gravel and stones. At the corner of section 34 we crossed the new road to Isle à la Crosse and, one mile and a half farther, Olsen creek which rises from a lake three miles and a half north of the line. This creek is forty links wide, but was not running at the time of the survey, the water, which was very good, being found in deep pools closed up by boulders which fill the bed of this stream at intervals. This creek runs close to the line across sections 33 and 32 until it connects with Doré river four miles farther on.

In township 70, range 11, a great amount of large timber was destroyed by a fire that started early in the season and spread even to the shores of lac La Plonge. Traces of this fire were also seen north of La Plonge river, when I was travelling between the mission and the west end of the lake. The distance across is about four miles.

West of Olsen creek, and as far as Beaver river, in section 34, township 68, range 12, the soil is very good, and consists of sandy loam eighteen inches deep. The fires which swept over this section years ago did not extend their destructive work beyond range 12, where the green timber begins again and the forest continues unbroken to the valley of Beaver river which, on the east side, is bounded by high detached hills with narrow valleys, where we found many ponds fringed by hay meadows. At the crossing of the line, the Beaver river is ninety yards wide and its banks are about ten feet high. In the main channel the water is from four to eight feet deep, with a current averaging two miles an hour. From both sides of the valley the poplar woods extend to the banks of the river.

A quarter of a mile south of the line, Doré and Beaver rivers meet. At that point there is a pronounced horseshoe bend in the river, east of which is an overflow lake with extensive hay marshes along part of its shores. Half a mile above the confluence of these rivers are high sandy cut-banks on top of which some trappers erected a shanty which we were glad to use this fall to store our supplies as they were being brought down from Green Lake trading post. In that vicinity we also came across a sled road leading almost due west to Long lake, three miles and a half west of the



river. The old "freighter's road," used in the early days by the half-breeds from Green lake did not pass by "Grand rapids" but followed another valley or depression nearly parallel to that of Beaver river and only a few miles farther west. In this depression are many open swamps and lakes which, with Long lake, formed an ideal winter road, as there were very few steep hills to ascend, and also giving a most direct route when compared with the one opened later on along Beaver river, whose bends and turns it generally follows.

The Hudson's Bay company used to have a depot on the right bank of, Beaver river, at the foot of "Grand Rapids," but last summer the buildings were pulled down, and the lumber collected into a raft which was floated down stream to Isle à la Crosse, so that, at present, there is no accommodation for travellers between the mouth of Waterhen river and Kennedy's house, which is about four miles south of La Plonge post. At two miles above "Grand Rapids" are some hay meadows close to the banks of Beaver river, and it was from these that the Company used to procure all the hay required by their freighters. This year they sent some of their hired men from Isle à la Crosse to put up hay for my ponies, but many of the stacks must have been built when it was raining, for, in the fall, I found this hay all mouldy and heating to such a degree that smoke was issuing from it. There are other hay flats along the banks of the river, below the rapids, but to be of any real value they would have to be cleared of the clumps of willow growing on them. They would also require considerable drainage, and it is not very apparent how this work could be carried on successfully, in most cases, for their surface is very little higher than the present level of the water of Beaver river, and the surplus water, which is the overflow from springs rising in the hills bounding both sides of the valley, is held back by an embankment whose top, covered with thick willow, rises six to eight feet above the level of these meadows.

Between "Grand Rapids," which is five miles north of the correction line in township 67, range 12, and the confluence of Beaver and Doré rivers, the banks are generally six to twelve feet high except in two places, where, on the west side, are high sandy cut-banks, the highest ones beginning near an Indian trail which leads northwesterly to Long lake.

The country west of this portion of Beaver river is broken by steep hills, on which banksian pine, from six to ten inches in diameter, is the prevalent timber. This hilly country goes three miles and a half farther west to the depression of Long lake, a body of water of variable width but nearly eight miles long. The line struck this lake, which lies almost due north and south, near its center, and three-quarters of a mile south of its narrowest part, which is less than fifteen chains wide. Here we had intended at first to ferry the camp outfit on rafts and swim the horses, but after carefully examining both shores which are simply quaking bogs merging into clear black mud far into the lake, I saw the danger of risking our ponies in such a treacherous place where they would certainly have sunk and been drowned. To go around the south end of this lake and its many deep bays meant the opening of at least twelve miles of road, part of which would have to be brushed or corduroyed.

After the shores of the lake had been further explored, firm ground was found north of the Narrows, and although the lake is quite wide at that spot, I did not anticipate any trouble in swimming the horses over to the opposite shore provided no wind should rise on the lake while crossing.

While a strong raft was being built for transporting the camp outfit and supplies across the lake, a path was cleared around the deep bay, south of which our camp was situated, in order to bring the pack animals to the crossing. When the time came to send the horses across, several Indians who had spent the summer in this vicinity offered their services, which were gratefully accepted.

After the whole outfit had been transferred to the west shore of the lake, the survey of the line was resumed. In section 35 of range 13, it intersected again one





Photo by G. H. Blanchet, D.L.S.  
Nineteenth Base Line West of the Fifth Meridian, Across Christina Valley.

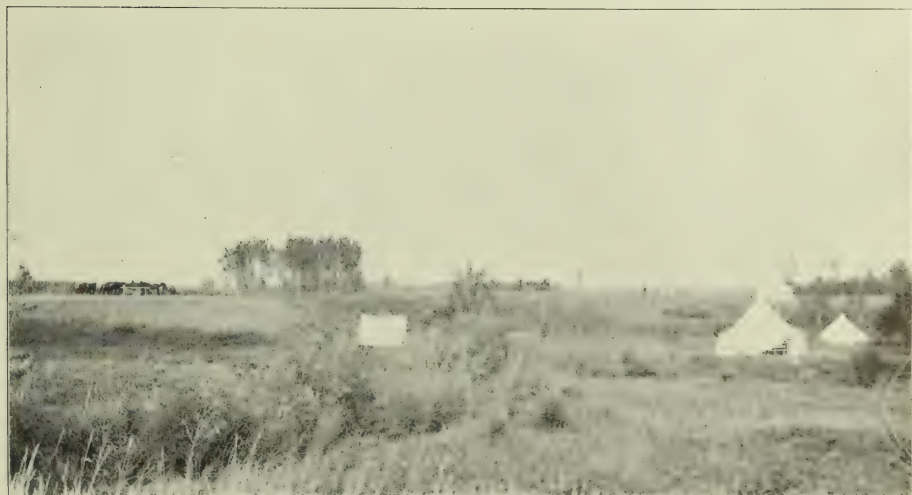


Photo by J. S. Galletly, D.L.S.  
Camp in Township 109. Range 14, West of the Fifth Meridian.







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of the deepest bays of this lake. Beyond the bay, the country is a succession of wooded ridges with great marshes almost to Burnt river, a swiftly running stream a chain and a half in width, and with numerous rapids. It flows out of Burnt lake at a point on its east shore, one mile south of the line.

This large lake lies partly in townships 68, ranges 14 and 15, and extends south to the north boundary of township 67, range 14, while northwards its shore runs one mile beyond the base line. It is very shallow, especially along its west shore, where wide mud banks spread far into the lake.

## DESCRIPTION OF THE COUNTRY WEST OF BEAVER RIVER.

Strips of rolling land, separated by narrow but deep valleys, following a north and south direction form the principal feature of the country west of Beaver river. Two of these valleys deserve special mention.

The first one west of the Beaver valley follows closely the outline between ranges 12 and 13 for fifteen miles, but in section 24, township 70, range 13, it turns northwest, and eight miles farther on it meets the other valley in which Burnt river flows almost due north to Canoe lake. The valleys join at the north boundary of township 70, where Burnt river receives its principal eastern tributary. From the confluence of these streams the main valley spreads out to the nearly level section of land surrounding Canoe lake, where there is an Indian village.

In the first-mentioned valley, there are, besides Long lake, three others from two to four miles long and connected by streams that are navigable for canoes. There are small islands in every one of these lakes. The outlet of the most northern one flows northwest for five miles before joining Burnt river. Soon after it leaves the last lake the only rapids which interfere with its navigation occur. Through these, the Indians have made artificial channels by removing a large number of boulders, but as, at the time of our visit (October 11, 1912) the water was very low, it was not advisable to risk the canvas boats in such places, and the exploration of the country to the valley of Burnt river had to be done on foot. Below the rapids, the creek winds in a valley from a quarter to half a mile wide. In several places I saw some hay meadows along both banks, although most of the bottom lands are covered with clumps of willow. This creek is about three feet deep; its banks are nowhere high and its current will average two miles an hour.

The prominent long range of hills rising at variable distances from the east shores of all these lakes is sparsely timbered with small poplar and in many spots they appear to be covered with light scrub only. The country adjacent to their western shores is low and swampy, especially along the banks of the stream in sections 31 and 32, township 69, range 12, which joins the second and third lakes. North of these swamps the land rises gradually and at the creek the benches attain an elevation of forty feet above the bottom of the valley. Fires have cleared large areas of all timber and moss; the soil is remarkably free of stones, and consists mostly of clay loam. Near the valley of Burnt river the tops of the benches support a good growth of poplar, and I also saw some spruce, cotton-wood and birch nearer the creek. On the north side there is quite a high ridge where banksian pine is the most common timber.

The valley of Burnt river is covered with tangled willow and alder, which are almost impenetrable.

South of the swampy land found in the northwest quarter of township 69, range 12, there is yet much green timber, generally large poplar and pine. The forest continues south of the base line.

Between Burnt lake and the seventeenth correction line is a wide section of low lands, drained by two large streams and their tributaries. Both streams enter the lake at its south end, and their estuaries are only two miles apart. The first one is



fifty yards wide, has low banks and for a distance of four miles from the lake shore, its current barely perceptible. At that point it branches. Although the left branch is the wider and deeper of the two, it has much the appearance of a slough receiving the overflow or seepage of the marshes which adjoin it. I believe it branches off in every direction among these marshes as is often the case in this country with streams in which no current can be detected. However, I did not have time to investigate this matter as it was then October and the days were getting shorter, and I had to explore the other branch which had well-defined banks. We had not paddled up that last stream very far before we noticed that the current was gradually increasing, the stream all the time winding across a nearly level country covered with low bushes. At one place we saw a few spruce measuring up to thirty-six inches in diameter and from the time which had elapsed since we passed the forks I concluded that we must have been then very close to the correction line. Before turning back, the explorer climbed the tallest of these spruce and from his observation point he saw some hills about two miles to the southeast and others considerably farther in a southwesterly direction. The rest of the country is described as flat and covered with small willow, birch and other low bushes. This low country is probably the continuation of the open and impassable bogs we had encountered on the other base line. Where we turned back, the stream was forty links wide, about five feet deep, with a sandy bottom. Its banks never rise above five feet and were everywhere covered with a thick clump of willow. The water was very clear and teeming with whitefish.

On September 12, I left my camp at Long lake and travelled to Beaver river, and thence proceeded by boat to La Plonge mission, twenty-eight miles farther down stream in order to buy some provisions and get my mail, which through a misunderstanding had been carried north instead of being delivered at the line.

A short distance above La Plonge village, Beaver river divides into several channels. To reach the mission landing one must follow for a distance of two miles the most eastern one, less than a chain wide in places, and very tortuous. This branch of Beaver river approaches a high and well-wooded ridge where it meets La Plonge river which has to be ascended a considerable distance in order to make the landing.

An alternate route, sometimes used by the Indians who go to the mission, is by portaging the canoes across the hay marshes which are in this vicinity the principal feature of the Beaver valley.

La Plonge river runs close to the foot of the bench where the orphanage and the other buildings of the mission stand. These are lighted by electricity and supplied with water for domestic purposes by power derived from La Plonge river. The same water-power drives the machinery in the saw-mill and planing-mill which belong to the mission. In this neighbourhood there is a large acreage under cultivation, part of it being in gardens where all kinds of vegetables grow luxuriantly, and the rest in fields of oats and barley that never fail to mature. Hay in unlimited quantities can be procured from the flats along Beaver river.

After securing my mail and purchasing supplies, I proceeded at once to the line, where I arrived on September 16.

All through the lands explored last summer, most of the timber is second growth. There has been very large spruce in many places at some former time. But fires have swept over this country so often that now there is very little milling timber, although in some sections the trees grow large enough to be suitable for railway ties, telegraph poles, piles, etc.

Much of the smaller timber could be turned into pulp. It has now been demonstrated from experiments that the banksian pine (so commonly met in this northern country) is entirely suitable for the manufacture of newspaper.

The immediate source of revenue for many years to come will be principally derived from the fishing industry. The companies which are licensed by the Government to carry on this trade, are yearly extending their operations by opening new



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routes to lakes which are known to be well stocked with the best varieties of fish, but which, owing to the lack of roads, were inaccessible except to a few nomad Indians. The catch of whitefish alone, in the northern part of this province was last winter estimated at three million pounds, which sold at a very remunerative price. Lake trout, which a few years ago was not marketable, now meets with a good demand, and as it is only caught in certain lakes the price is sure to rise; of the other varieties, such as pickerel and pike, which are found in all lakes and streams, enormous quantities are annually disposed of, but by the wise protective laws enforced by the provincial authorities, there is no danger that these lakes will ever be depleted. So far this industry has been carried on only during the winter, but some of the railway companies are beginning to see what a large revenue this new industry can be made to pay them, and consequently they are preparing to supply specially constructed cars to handle properly this food product at all seasons.

The fish industry is yet in its infancy in the province of Saskatchewan, but it is sure to develop in the near future, insuring an ever increasing source of revenue to the Government and a good income to the parties who have invested their capital in the enterprise.

The Isle à la Crosse Fishing company, who are the leaders in developing this industry here, have spent large sums of money in opening a winter road to La Plonge mission, one hundred and ten miles north of Big River. Their road affords a most direct route and the easiest grade for the increasing northern trade, and the Company is encouraging the freighters to travel over it by building at shorter intervals new stopping-places and changing the original location of these where the supply of water sometimes failed during the coldest weather.

The manager of this Company has offices at Big River station, which is the terminus of a branch of the Canadian Northern railway and the distributing point in this province of the output of the Company's fisheries.

On October 5, the survey of the eighteenth base line had been carried to the west shore of Burnt lake, near the middle of range 15, but poor and insufficient grass, since we had left Long lake, added to the inclemency of the season, was playing havoc with my pack animals, which were gradually weakening under the strain put on them in transporting our outfit. Under such conditions, and with the knowledge that the hay put up for them in the Beaver valley was too much spoiled to be of any use, I was compelled to suspend my operations for the season. When returning to the valley of Beaver river the men widened and otherwise improved the pack-trail, so that it could be used for sleds later on, taking advantage for this purpose of all open swamps and muskegs.

A few miles above "Grand Rapids" our road connects with the freighters' road to Green Lake.

On October 22, when I arrived at the mouth of Waterhen river, I was able to procure from a squatter some loose hay for the ponies, which were kept there till the morning of the 24th, for a much-needed rest, and also because we had been informed that before they could reach Green lake (a three days' journey) they would have to feed on what frozen grass they could pick along the road. I also had to rent a shack and store part of our outfit which was too cumbersome for the number of horses that were still fit for packing.

On October 24, we crossed Waterhen river and continued our journey southward over the Government road opened last summer through the woods along the left bank of Beaver river, as far as Waterhen river.

This road makes a junction with the Green lake trail south of Beaver river. It is fairly straight, well located, and when graded will be of great assistance to the incoming settler now that this section of country is all subdivided.

On October 24, we camped for the night at Rat creek, and the horses were driven to some hay marshes up the valley.



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In the afternoon of the next day we came to the valley of Beaver river. Although there was, north of the river, an extensive hay meadow where our ponies might have had plenty of grass, such as it was, I did not consider it wise to stop at this place. In the early part of the day I had seen much floating ice on the river and I feared that if the outfit did not cross immediately, we might later on be much hampered, if not actually stopped by it. So we went to camp on the opposite side of the river, everyone wading the best he could through the icy waters which, in places, reached well above the waist. At this crossing there is a rapid and the ponies had to follow a circuitous way before they came to the river bank.

Last summer the Dominion telegraph from Battleford was extended this far, and will soon be continued north.

Quantities of telegraph wire have been shipped here, and many telegraph poles have also been handed to the new road, ready for continuing this line to Isle à la Crosse.

Lately a branch of this line has also been built to Green Lake trading post, and I am informed that a telegraph office is now opened at this post.

On October 26, we arrived at Green Lake, where arrangements were made with the mail carrier who was going to Big River for carrying part of the men's baggage so as to lighten the ponies. We were six days on this trip. At Big River we took the train to Prince Albert, where we arrived on November 5. My party having been paid off, I started to make preparations for continuing my surveys during the winter.

#### GENERAL REMARKS.

Last season was a particularly bad one from a surveyor's standpoint. Unfavourable conditions for observing, due sometimes to smoke but more often to long spells of cloudy weather, interfered much with astronomical work, and for that reason I did not get as frequent observations for checking the bearing of the line as I desired.

In the district where I was surveying, frosts occurred during the nights of June 4 and 5, and again on the nights of July 16, 17, 19 and 20, when ice a quarter of an inch thick formed on water kept in receptacles in the tents. These frosts were also felt at La Plonge mission, where the barley suffered to a certain extent, although oats stood them well.

No minerals were found along the lines surveyed, but the abnormal declination of the magnetic needle in the first ranges west of the third meridian would indicate the presence of mineral deposits along a belt which extends southerly across the seventeenth and sixteenth base lines, because the same irregularities were noticed there at the time I surveyed these lines.

Beavers were seen at work on all streams in the country adjoining the third meridian. Bears are quit common, also coyotes, foxes, lynx, marten, mink and weasels.



## APPENDIX No. 44.

## ABSTRACT OF THE REPORT OF B. H. SEGRE, D.L.S.

## MISCELLANEOUS RESURVEYS IN SOUTHERN SASKATCHEWAN.

I organized my party at Regina and, on August 31, 1912, left for Raymore to investigate the duplicate monuments reported to be found at the northeast corner of township 27, range 19, west of the second meridian.

Raymore is a thriving settlement of about two hundred inhabitants, situated on the Grand Trunk Pacific railway, and was at the time of my survey the headquarters of the Pearson Land Co. There are no water-powers or streams near, the water supply being obtained from wells. The soil in this locality is a heavy black loam, producing excellent crops, the average yield of wheat being in the neighbourhood of thirty-five bushels per acre. There is a considerable amount of scrub in this locality and, the district being new, very little clearing has been done.

On completion of the investigation which was delayed by continuous rains, and having destroyed the erroneous monument as instructed, I left for Yorkton by way of Melville, on September 10. My work there was the investigation of portions of the northeast quarter of section 34, township 26, range 2, west of the second meridian. This was completed on September 17, and I returned to Yorkton on the following day. Yorkton is one of the important towns in Saskatchewan, being situated on the branch of the Canadian Pacific railway from Winnipeg to Edmonton and on the Grand Trunk Pacific branch line to Canora; it is expected that the Canadian Northern railway will also enter the town shortly. The town is lighted mostly by electricity and has also a municipal acetylene plant. There are several banks and churches, and the International Harvester Co. have just completed a large warehouse and distributing plant. The only river in the vicinity is a small stream called Whitesand river. The sewage therefore has to be treated in a septic tank before being allowed to flow into this river.

I left Yorkton on September 19 by way of Saskatoon for Duck Lake settlement, arriving there on the 20th. This is a small settlement of about seven hundred inhabitants on the branch of the Canadian Northern railway from Regina to Prince Albert, and is the centre of a large and prosperous farming community; there are several churches, a bank and an industrial school for the Indians located there. On September 24, I left for township 46, range 3, west of the third meridian, to investigate the conditions in sections 22 and 15 as a result of duplicate monuments being on the ground. I made the necessary changes as instructed, completing them on November 19. The soil in this locality is of a light sandy nature, the district is not being settled rapidly on account of the thickness of the scrub, many sections requiring a great deal of clearing before extensive farming operations could be carried on. There are numerous sloughs in the vicinity of township 46, which would make the locality more suitable for the raising of stock than for grain, as ample hay could be secured along these sloughs for feeding in winter. On account of the trouble arising from the duplicate monuments, no road improvements of a permanent nature are being carried on, and these are badly needed, as the farmers have to wait for the snow in order to move their grain for shipping, thus losing the advantage of securing the better prices of the early markets.

On completion of my work at Duck lake, I left by way of Saskatoon for Renown. I arrived there on October 4 and made an investigation of the width of the road allowance along the correction line between township 30, range 27, and townships 31,



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ranges 26 and 27, west of the second meridian. I corrected the error along the south boundary of section 6, township 31, range 26, and made investigations which showed that the error extended along the correction line both east and west from the lines ordered to be surveyed. The district is well settled, and, being very near the railroad, should go ahead very rapidly. The soil is of very good quality but is underlaid with large granite boulders. Grain is shipped from Renown on the Canadian Pacific railway, but most of the settlers go to Watrous on the Grand Trunk Pacific for provisions, etc., hence there is only one store and a lumber yard at present in Renown. The water in this locality has an alkaline taste, but is easily obtainable by sinking wells.

Having completed the above investigation, I left for Davidson on October 12 by way of Saskatoon and arrived there the same night. On the 14th, I went to work in township 28, range 27, west of the second meridian, a distance of twenty miles from Davidson. The work here consisted in investigating the error in the position of a witness mound marking the northeast corner of section 16. This error was located in the southeast quarter of the above section and on completing the lines around the block I found an error of one chain in the lengths of the east and west boundaries of this block. As the lands were patented and the owners of the southeast and southwest quarters of section 16 would be losers if the quarter post on the east boundary only were changed, I submitted a report to this effect and on receipt of a favourable reply on October 26, I returned to the township and made the necessary corrections suitable to the different owners. I also placed posts at the quarter section corners where none had been erected at the time of the original survey, through the presence on the ground of sloughs which since have dried up.

This locality is very thickly settled to the south and west of this work but, as the land rises to the north and east and is very much broken up by valleys, settlement is retarded for a time; also the lack of railroad facilities is keeping the locality back, the drive to Davidson being twenty miles, with one steep climb out of the valley of Arm river. The drive to Imperial is only fourteen miles, but the road is very rough, hence Davidson is preferred by most of the settlers. All the sloughs here have dried up considerably, and many farmers experience difficulty in securing a good supply of water except at a depth of from sixty to eighty feet. Davidson, the main outlet for the grain of this community, is a very enterprising settlement of about 800 inhabitants; it owns an electric lighting plant, power being generated by a gasoline engine. On October 28, H.R.H. the Duchess of Connaught laid the corner stone of a hospital to be erected there. There are several churches, two banks and five grain elevators; I was also shown some samples of brick made of clay obtained from a farm a few miles out of town and they were very good indeed. It was the intention of the promoters to interest capital in the venture and get started manufacturing brick as soon as possible.

Having completed these investigations, I returned to Davidson on October 19 and on the 21st left for Rosemae to investigate a lake on the southeast quarter of section 16, township 25, range 3, west of the third meridian. As a result of my investigation I found that although this quarter section was lower than the surrounding land, the water had dried up since the original survey was made. There was a rich crop of vegetation growing on the quarter and hay had been cut from it for many years. From present appearances it is not likely that this quarter will ever be under water again, and it is therefore quite suitable for farming purposes. I completed this work on October 24 and, returning to Davidson, I was engaged in preparing sketches until the receipt of your telegram of October 26 when I returned to township 28, range 27, and made changes as instructed. I completed these changes on October 28, and returned to Davidson.

On October 29 I packed my outfit and left for Aylesbury. The following day I drove out to section 2, township 24, range 27, west of the second meridian, to investigate an error on the east boundary of section 2. This error I located in the



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northeast quarter of section 11, and found that it had been carried through to section 2. The lands there were nearly all held by persons residing outside the district and considerable trouble was experienced in locating the owners in order to have the petition signed. I also had some trouble in getting the present holders of sections 1 and 2 to come to an agreement over some improvements affected by the change. Having adjusted these matters and obtained the signatures to the petitions I left for Caron by way of Regina on November 6.

I arrived there on the 8th and left the next morning for township 16, range 30, west of the second meridian, but on receipt of a wire on November 13 instructing me to return to Duck Lake, I immediately drove out for my outfit and assistant and left for Duck Lake settlement on November 14. On reaching Regina after completing my work at Duck Lake I had to hire another assistant owing to my former one leaving. I next left for Mortlach on November 23 and for township 16, range 30, on the 25th. The work there consisted of destroying a duplicate monument marking the northeast corner of section 24 and this was done after due investigation. The surface is very rolling in this township and rises sharply to the east. It is, however, thickly settled and the soil is a good loam, producing excellent crops. This township may be reached from either Caron or Mortlach, small towns on the main line of the Canadian Pacific railway.

I completed the above investigation and, having received instructions to extend the subdivision lines across the dry portions of Pelican lake which lies north of Mortlach, I proceeded to that vicinity on December 2 and started on the extension of these lines. I found the southeastern end of this lake completely dried up, but the soil being alkaline the growth of grass is not heavy; the middle of the old bed in township 18, range 30, is still a little marshy but by draining towards the southeast the whole bed should provide good pasture land, and, after a few years ploughing, it should begin to produce grain. I carried these lines up to the third meridian and abandoned further operations owing to the depth of the frost retarding the progress of mounding.

On December 16, I left Mortlach for Pennant, where I arrived on the following day, to investigate an erroneous monument on the north boundary of section 10, township 18, range 17, west of the third meridian. I corrected this after noting improvements affected and returned to Regina on the 19th.

I then proceeded to Yorkton to obtain signatures to a petition for re-establishing the northeast corner of section 34, township 26, range 2, west of the second meridian.

Having received instructions to close operations for the season, I proceeded to Winnipeg where I stored my outfit. I then left for Toronto, arriving there on January 5, 1913.



## APPENDIX No. 45.

## ABSTRACT OF THE REPORT OF F. V. SEIBERT, D.L.S.

## MISCELLANEOUS SURVEYS IN SOUTHERN SASKATCHEWAN AND ALBERTA.

The miscellaneous surveys on which I was engaged in the southern parts of Alberta and Saskatchewan were of widely different natures. They consisted in restoring and establishing obliterated and lost monuments; locating and correcting, where possible, errors in the original surveys; resurveying the beds of a number of prairie lakes which had dried up since the original survey; traversing the shores of lakes where the beds have sensibly altered since the original survey; investigating all manner of communications received by the Department from the settlers with reference to surveys. Briefly, the work consisted of those surveys and investigations on which it was not thought advisable to place a regular party and which could best be done by a surveyor and his assistant.

This work took me over the greater part of the prairie portions of Saskatchewan and southern Alberta. On every hand I found indications of prosperity. The most optimistic reports in the past of the possibilities of this country are being realized. Railway development is taking place in almost every portion of the country, improvements were noticed on every hand, and towns are springing up as rapidly as the railways permit. In a few months a settlement of one, two or three hundred people springs up where before there was nothing except the bare prairie. This is generally the case just as soon as freight can be taken over the newly laid steel and sometimes even before. But rapid as the development is, it cannot in every instance keep pace with the needs of the country. We covered some sections of the country where the soil and climatic conditions were of the best and where all the available homesteads were taken up. Yet it was so far from railway facilities as to make the growing of grain for sale a losing undertaking. In some cases the settlers had to haul their grain seventy-five to eighty miles to market. In the greater part of the country, however, the railways are following the settler very closely and in most cases just as soon as he has any grain to sell he has a railway to take it to market.

Covering as much of the country as I did I could not help noticing the excellent class of people who are making this country their home. Many of them were old pioneers, though more often sons and daughters of old pioneers of the Dakotas to the south, or Ontario to the east, or of other portions of America. Many of them brought money and settlers' effects into the country, while others came with almost nothing. Those who came with sufficient for a start were able to take advantage of the low price of land and to secure large holdings, while the poorest were able, after a few years, to extend beyond their original homestead and pre-emption.

This reaching out after more land in many cases leads to careless farming. A number of farmers in different sections of the country are trying to farm too much, with the result that their land is impoverished by weeds and their profit for any individual year is not as much as it would be on less land properly cultivated.

One other thing noticeable is the lack of mixed farming. The growing of grain in the past has been so profitable, and the work so much more desirable than was the raising of stock, that the latter kind of farming has been neglected. These things will no doubt right themselves in time. The increase in the price of stock has already started many into stock farming, and a few years will see a decided change.

The success of those already in stock farming is sure to have its result.

Besides our regular survey work observations for magnetic declination were taken wherever possible.



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## APPENDIX No. 46.

## REPORT OF N. C. STEWART, D.L.S.

SURVEYS IN THE RAILWAY BELT.

VANCOUVER, B.C., February 10, 1913.

E. DEVILLE, ESQ., LL.D.,  
Surveyor General,  
Ottawa, Canada.

SIR,—I have the honour to submit the following report of my season's operations in the railway belt of the province of British Columbia.

I left Enderby on May 14, 1912, for my first work in township 18, range 7, west of the sixth meridian. The wagon road between Enderby and Mabel lake runs through this township. This road has been widened out and graded during the past season, and is now in good shape, but the soil through which it passes is a heavy clay, which makes it very muddy and sticky after a rain. Owing to the numerous logging operations carried on in this vicinity and on Mabel lake, and to the large number of settlers along Shuswap river, this road is very much used. A branch road, built by the settlers, which leaves the main road about seven miles from Enderby, enabled me to bring my supplies to section 30 with wagons.

I completed the surveys of four sections in the northwest part of the township. A few small benches of good land were found, and the hillsides were covered with grass, making them good for grazing purposes. The soil is a light sandy loam, with a gravel and drift-rock subsoil. The timber has been nearly all burnt off, but a few large fir and bull pine remain. The upper benches in this valley have been cultivated very little, but some good results have been obtained, especially in the raising of vegetables, hay, grain and small fruits. The climate during May and June was all that could be desired, warm days with cool nights but no frost, and only a few days of rain.

I ran two miles of line on the east boundaries of sections 6 and 7 in township 19, range 7, but found only rugged and worthless mountain tops, from which the timber had all been burnt.

On June 4, I moved across Shuswap river to the northwest quarter of section 23, township 18, range 8. A branch road was being built from the Mabel lake road to Trinity valley, a bridge having been erected over Shuswap river on the east boundary of section 22. This road was completed in the fall. The soil along the river is a rich clay loam, which produces hay, grain, vegetables and fruits in abundance. On the benches along Trinity creek a light sandy loam with a gravel subsoil was found. No one has tried to cultivate these benches up to date. The country west of Trinity creek is covered by some marketable timber, but to the east of this creek a bush fire occurred during the previous summer which destroyed most of the timber. Trinity creek has several high waterfalls which might be used for power sites, if the water supply was sufficient in the dry season. More rain falls along Trinity creek than on the north side of Shuswap river.

Game is plentiful in this neighbourhood; black bears, deer and blue and willow grouse were frequently seen.

On June 15 we took the train at Enderby for Field, where we camped in one of the most picturesque spots in the Rockies, on the northern slope of Cathedral mountain, and in direct line with the famous Yoho valley. My work here consisted chiefly in retracements and making ties to the Canadian Pacific railway survey.

The only industry in this part is mining. The Monarch mine is situated on Mt. Stephen, in a very romantic locality. About twenty men were employed, and the mine was said to be paying dividends. The ore is silver-lead.



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The old grade of the Canadian Pacific railway has been made into a wagon road, thus affording a means of travel from Field to Hector, and a good road has been constructed from Field up the Yoho valley for the use of tourists. We had excellent weather during our two weeks' stay. We returned to Moberly on July 1 and commenced regular subdivision work in township 28, range 22, west of the fifth meridian. The soil in this township is a sandy loam, with a clay loam subsoil in many places, which should produce hay, grain, small fruits and vegetables. The land of a similar nature which has been cultivated around Golden produces good crops. A hill between 200 and 300 feet high is found along Columbia river; back of this hill is a more or less rolling bench land which varies from about a mile in width at the south boundary of the township to over five miles at the north. East of this bench rise the rugged slopes of Moberly peak and the mountains to the north of it. Practically all the trees have been burnt, and a thick second growth covers the fallen timber, making travelling and clearing difficult. A road has been built from Golden to Blaeberry river, a distance of nine miles, and a branch road was built by the squatters from Moberly to section 11. A trail from Moberly up Blaeberry river is utilized by the trappers and settlers along that stream. The farmers along Columbia river are very prosperous, mixed farming being found to be the most suitable for this region. The meadows along Columbia river afford a supply of hay for feeding the stock during the long winter. Quite a few trappers still operate in this district, and large game such as bears (black and grizzly), moose, deer, caribou, goats, coyotes and cougar are plentiful; rabbits, grouse and ducks are fairly numerous. Good fishing is to be had at places along Columbia river, especially at the mouths of the clear-water streams from the Selkirks. Much rainy weather was encountered during July and August. A large forest fire occurred in this township and those to the northwest in June, and another large fire destroyed much valuable timber south of Golden. I completed the survey of all land suitable for agriculture in this township east of Columbia river on August 10.

Leaving Beaver mouth on August 12, in three heavily loaded canoes, we drifted down to the mouth of Gold river in township 32, range 26, west of the fifth meridian, in about six hours. At the mouth of this river a large flat was found composed of large marshes from which hay could be cut and which were subject to overflow from Columbia and Gold rivers. Around the marshes, large timber, chiefly spruce, was found. Gold river has its source in some of the highest and most picturesque peaks of the Selkirk range, and the melting of the numerous glaciers in these mountains on a hot day causes the water to rise at the rate of about a foot an hour, and the cool nights following cause it to subside almost as rapidly.

On August 28, we moved camp to Bush lake by going up Bush river to the creek and thence to the lake. Here we completed two miles of the belt limit. The country around this lake is all heavily timbered. The land in this township is not very suitable for agricultural purposes, but the wild hay will be valuable when logging operations commence on the numerous timber berths in this territory. The proximity of the glaciers has a bad effect on the climate, and we had very wet weather during our stay on the lake.

Bush lake is at present an ideal spot for a sportsman. There were hundreds of ducks and geese there and its waters were full of rainbow trout. Fur-bearing animals such as beaver, mink, marten, and skunks are plentiful. Two black bears were seen, and the tracks of numerous caribou and goats are to be found on the mountains. Combining this with the fine scenery, the unsurpassed mountains and the ease of canoe travel, I believe one could not find a better place for an outing.

We left Bush lake on September 6, and proceeded up Columbia river to section 17, township 31, range 25, west of the fifth meridian. At two large bends in the river there, I found some land which is suitable for agricultural purposes, although the area of this land is not very great. The soil is a sandy loam with a clay loam subsoil. I examined part of this township to the northeast of Columbia river and though I found no more land suitable for farming, I did find some excellent timber



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consisting of large fir, pine, cedar, spruce and balsam. Numerous grouse and ducks were seen, and I might also mention the presence of mosquitoes.

On September 11, with one canoe, I left for Beavermouth, Mr. Johnston following next day with the crew and outfit. We left that place and arrived in Rogers Pass on the 13th.

The survey of the townsite of Rogers Pass was completed on September 21, after which we returned to the Enderby district to complete the surveys there before the snow came. Our work in township 17, range 10, west of the sixth meridian, was reached by wagon from Armstrong. This work was chiefly retracement. The productiveness of the soil in this neighbourhood is shown by the prosperity of the farmers who all have good homes, large barns, fine horses, cattle, sheep, &c. The orchards produce more fruit than can be taken care of, and many acres of potatoes have been left until spring for harvesting owing to an over supply. The growing of celery is becoming a specialty with some of the farmers.

From this township we proceeded by wagon to Deep creek valley where we found a very prosperous community engaged in mixed farming. The land subdivided in township 19, range 9, is all on the west side of the valley. The country had all been burnt over several years ago and a very dense second growth has sprung up. The soil in the bottom lands is a clay loam and on the benches and side-hills it is a sandy loam with numerous rock outcrops. The settlers are very optimistic about the productiveness of the soil in this valley. As the altitude is considerably higher than at Armstrong very little fruit growing has been attempted, however it has been shown that the hardier fruits can be grown. Snow fell on October 19, and all the month was very wet. Willow grouse were very plentiful.

On October 24, I again moved to township 18, range 8, and surveyed the north boundary of section 14, after which we went to township 20, range 8, where we made surveys in sections 15 and 22. A few small benches of fairly good land were found, the soil being of a light sandy loam suitable for growing fruit and vegetables. The fruit farmers in this district are very prosperous.

The towns of Enderby, Armstrong and Salmon Arm are in a flourishing state owing chiefly to the farming and lumbering industries. The prospect of the coming of the Canadian Northern railway into Armstrong has enlivened that town considerably and the completion of the road will no doubt advance the prosperity of the settlers since it will give them another outlet for their produce. The lack of sufficient transportation is at present the principal drawback to this neighbourhood.

We moved again to the vicinity of Golden to traverse part of Columbia river in townships 28 and 29, range 23, west of the fifth meridian. This work was made very easy by the low water. In these townships the Columbia is broken into numerous channels, and the islands are all timbered with spruce, jackpine, balsam and cypress. The large timber was logged off several years ago. The soil on the islands is a sandy loam with a clay loam subsoil and therefore should be suitable for agricultural purposes. I also surveyed some of the bench land in township 29, range 22, and township 29, range 23. This bench is a continuation of the bench land of township 28, range 22, and extends from Blaeberry river to Waitabit creek, a distance of about six miles and averages about one and a half miles in width. The soil is a light sandy loam with a gravel subsoil and should produce good results when cultivated. The timber has all been killed by fire, the most recent fire having been started last spring. Numerous settlers are trying to locate on this land which shows that it appears suitable for farming.

On December 4, I decided to disband the party on account of the depth of the snow and the dangerous condition of the river for canoeing.

I have the honour, to be, Sir,

Your obedient servant,

N. C. STEWART, D.L.S.



## APPENDIX No. 47.

## REPORT OF P. B. STREET, D.L.S.

## SURVEYS IN SOUTHWESTERN ALBERTA.

TORONTO, ONT., January 3, 1913.

E. DEVILLE, Esq., LL.D.  
Surveyor General,  
Ottawa, Canada.

SIR,—I have the honour to submit the following general report of my field work during the season of 1912.

I left High River with my party on May 24, and drove to township 5, range 17, west of the fourth meridian, where my first work lay. This township is open undulating prairie, and is now partly fenced by settlers. Owing to the dry atmosphere which prevails in this district, the settlers have been very unfortunate with their crops up to the present time, and unless they adopt mixed farming their future success will be very uncertain. We retraced all the interior lines of this township and, owing to an error in the west boundary, we were obliged to carry the retracement into the adjoining township to the west.

On completing this work, I moved to township 2, range 19, west of the fourth meridian, and retraced some section lines there. This township, with several others in this vicinity, is held under lease, and an occasional rancher's house is the only sign of settlement. Being situated on Milk river ridge this township is very rough and hilly, and owing to the high altitude it is doubtful if it will be of any use for agriculture, although it is ideal for ranching. We spent only a few days there, and then crossed to Cardston, reaching that town on June 24. I sent the outfit across country through Standoff, Pincher and Cowley, to a camp ground on Oldman river, and went to Lethbridge to get some axemen for the work in the mountains, as I had been short three men since I organized. Finding no suitable men in Lethbridge, I went to Calgary, and secured three men there. I was unable to secure a good packer, which proved a great handicap later as I was forced to train my teamster to do the packing, and this meant that I did most of it myself.

On rejoining my party north of Cowley, we proceeded up the trail from Cowley to the Gap, and from there to McEwen's ranch in section 6, township 12, range 3, west of the fifth meridian. Our trip was delayed several times by bad roads which had to be repaired, and by the rains which came every other day. The land in this district is very rough and broken. A series of ridges run north and south, with narrow valleys between them, affording very little land that could be used for settlement. The wagon road from Cowley runs as far north as section 12 of township 12, range 4, and a pack trail continues from this point up Livingstone river to its head-waters, and over the divide to the head-waters of Highwood river. A railway line was surveyed up this valley, but, as no coal lands of any importance are found along Livingstone river, it is very doubtful if this line will be adopted. We commenced our surveys here on July 3, but we were much delayed by the incessant rains which fell during the early part of that month. Luckily for us the timber in this township, though nearly all fire-killed, was not large, and the men, although unused to the mountains, soon got accustomed to the long walks across country. Creeks are very numerous in this township, and I was much impressed with the abundance of pasture which we found along the creek valleys. The grass grows very rank in the mountains, reaching a height of three or



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four feet at the end of the season. If the ranching commission decide to lease the forest reserve, there will be ample pasture for thousands of cattle. A fine crop of timothy hay was raised on McEwen's ranch in section 6 this year, in spite of the bad weather.

On completing the work in this township we moved up the northwest branch of Oldman river, and camped in section 9 near the buildings of the Great West Coal Co. A pack trail from this point follows the river to its head-waters, and is much used by the Indians of the Stony reserve, but like most Indian trails it was made very crooked to avoid as much cutting as possible. I looked over it and decided to abandon it and cut a wagon road up the valley to the west boundary of the township. This was accomplished without much difficulty, and we moved into section 36 of township 12, range 5. We found the country much more mountainous in range 5, and the hills had steeper slopes than we found east of Livingstone river. This country was fire-swept two years ago, and very little green timber can be found now for miles on either side of the river. The country is mostly covered with large windfall, which made walking to and from work very arduous. Considerable bare rock is found on these ridges, black and grey shale and conglomerate being the commoner kinds, and coal outcrops could be seen on the tops of most of the hills and ridges. We saw numerous deer in this locality, but small game such as partridges and rabbits were scarcely seen at all. The fishing was all that could be desired, there being no difficulty in catching a dozen or more any evening after supper.

We moved up Dutch creek early in September, and camped on the creek near the west boundary of township 11, range 4. This country did not suffer very heavily from the big fire two years ago, and large quantities of excellent spruce timber are found in sections 6, 7 and 18 of this township. These areas are all held under timber berths, but no cutting has been attempted up to the present. Dutch creek is too small for driving logs, and a wagon road will have to be built up the creek to enable the owners to get their logs out. We found the windfall in this locality to be the worst we had struck all season, and a great deal of valuable time was lost in walking to and from work. I had anticipated putting in some flying camps in this locality, but the time lost in cutting pack trails would have been too great. We had several snowstorms during September, which delayed the work, and made the chopping disagreeable.

On October 7 we moved up Racehorse creek to the mouth of Daisy creek, there being a wagon road to that point, and a pack trail from there to Lille. A telephone line was strung from Lille to the fire ranger's house, near the mouth of Racehorse creek this season. Our work in this vicinity consisted in surveying some mining claims on the western slope of the Livingstone range, and for the first time during the season we found the country so rough that we were forced to run quarter-section lines instead of the regular section lines. There was about six inches of snow on the hillside, which made climbing difficult and, at times, dangerous.

On completing the work here we moved through the Gap to township 11, range 3, where we surveyed some coal lands. We found this work much more pleasant than our former work as the hills in this locality have much easier slopes and the windfall which bothered us so much in the previous township was entirely absent. The hills are partly open in this township, and partly covered with large fir timber, which, being fire-killed is very hard to cut. A few cattle were being ranged on the hills, but there is an abundance of feed for many more. We finished our work in a few days, and moved up the valley of Callum creek to township 12, range 2. In accordance with your instructions, I examined the east half of this township to see how much of it would be fit for settlement, and decided that the whole eastern half would have to be subdivided. This township is rather hilly, and partly covered with large fir timber, the fir being confined mostly to the ridges, while the flat or undulating land is mostly open or covered with poplar and willow. The soil is rich, and in spite of the high



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altitude, a settler in section 12 managed to raise a good crop of potatoes this year. Small creeks are very numerous, and the pasture on the hills is excellent.

This district is filling up with small ranchers who intend to run their cattle on leases during the summer, and raise feed for their winter keep on their homesteads. The cattle industry has been paralyzed by the sudden disappearance of the big ranches which ranged thousands of cattle every year, but the passing of these ranches is a matter of great satisfaction, as they invariably kept large areas lying idle for winter range, when sufficient winter feed could have been raised on a tenth of these areas had they been cultivated. The new settlers who are now locating in the hills have the right spirit, and as soon as the Government decides the lease question, there will be considerable activity again in the cattle business.

Our work in this locality was constantly interrupted by snowfalls, though the temperature remained unusually high, and the snow disappeared in a few days. Early in December I found that I would be unable to complete all the work allotted in this vicinity, and decided to cease operations as soon as my rations were exhausted. We accordingly broke camp on December 14, and moved back to section 4, township 10, range 2, where I stored the outfit for the winter. On the 16th I drove into Cowley and paid off the men. I completed my business in this locality, and left for High River and Calgary the following day, to look after some details there. I left Calgary on the 19th and reached Toronto on the 23rd.

I have the honour, to be, Sir,

Your obedient servant,

P. B. STREET, D.L.S.



## APPENDIX No. 48.

## ABSTRACT OF THE REPORT OF A. G. STUART, D.L.S.

## RESURVEYS IN MANITOBA.

I arrived at Winnipeg on May 7, and spent the following two days in purchasing an outfit and organizing my party.

My first work for the season was the retracement of the principal meridian beginning at the international boundary. I therefore left Winnipeg on May 10, and travelled southerly over the old trail on the west side of Red river as far as Morris, and thence over well-travelled roads to Gretna.

The country through which we travelled comprises some of the oldest settled parts of the province, and is used almost exclusively for wheat growing. The roads we followed took us through thousands of the finest wheat fields, not only in the West but in the world, and we found the drive a very pleasant one.

In the vicinity west of Morris large areas of low land have recently been drained by the Provincial Government, and in this way large tracts of rich virgin soil have been rendered fit for cultivation.

Practically no homestead lands are available in the vicinity of the meridian south of Winnipeg. The lands in this district, being level or slightly rolling, and composed mostly of rich black loam underlaid with clay, command a value of from twenty-five to fifty dollars per acre. Notwithstanding this fact, each year sees the invasion of many moneyed settlers from the best farming districts of the western States to buy land in this district. Many of these are people whose parents left eastern Canada in the early days at the call of what was then the "greater west." These men, well versed in western ways and methods, are among our best immigrants.

To one accustomed to the ways of Quebec and the Maritime Provinces, the wealth and extensive harvesting methods of this older portion of Manitoba are amazing. The most modern types of farm machinery are seen on every hand, but it is very difficult to get men capable of handling and repairing these machines. The young men of the West are not going in for this kind of work, and the great need at the present time is for a class of skilled artisans and mechanical tradesmen.

After crossing the St. Francois Xavier settlement with the retracement of the meridian, we gradually left the prairie and entered a slightly rolling and more recently settled district, with scattered clumps of scrub and poplar. The settlers go in more for mixed farming, and many large and small dairy farms in the vicinity of Winnipeg supply the demands of the city markets.

A well-travelled road runs northerly close to the meridian for at least one hundred miles, and two lines of railway run northerly as far as the north boundary of township 20, both within ten miles of the meridian, making the daily Winnipeg market easily accessible for farm and dairy produce. Many range cattle are raised in this district. In the small towns along the railways there are many openings for tradesmen and business houses.

Along the meridian in the vicinity of townships 17 and 22 we passed through an extensive Galician colony. These people are fast making homes in the district despite the difficulties with which they have to contend. The country is heavily wooded with poplar, and the ground is covered with loose stone, so that in most instances it has to be cleared of both stone and wood before it is fit for cultivation. Notwithstanding these drawbacks, coupled with a lack of funds, these people are making good homes.



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Their children at school are particularly bright, and the parents, through a life of industry and clean living, are developing into Canadian citizens of which the country should be proud.

The cutting and loading of cordwood, consisting of poplar, spruce and tamarack, and marketing it in the cities, gives the settlers a means of making ready money in the slack winter months. In this way, quite an extensive business has grown up along the two lines of railway. In township 19 there are surface indications of fine quarries which will, no doubt, at some later date be developed.

Along the meridian from the source of Icelandic river, in township 22, to the northeast corner of township 28, where my retracement operations ended on September 28, the line continually crosses large and small hay sloughs, which make stock-raising easy and profitable through this district.

A railway is at present under construction as far as Fisher river, and there is still much land open for homesteading which, when cleared of the timber and surface stones, will make first-class mixed-farming land.

Game in this district is fairly plentiful, moose, jumping deer, bears, partridges, prairie chickens and muskrats being found.

There are large areas of excellent grazing land, the hay needing only to be cut and stacked for winter. In lake Winnipeg, near by, large quantities of fish, including whitefish, sturgeon, pickerel, etc., are annually netted for domestic use and for market. Fuel and the best of building material can be obtained practically at one's door.

Notwithstanding these advantages, a homestead, although requiring the investment of only a trifling entry fee, has its conditions not governed by dollars and cents. It requires, as its owner, a man used to hard labour, and when the city clerk, tired of life and with a moving-picture idea of wheat fields and ranching, attempts it, he usually fails. Nevertheless, it is one of the best opportunities in the West to-day.

In the retracement of the meridian we touched on the borders of Indian reserves Nos. 16 and 44. In these reserves the land is good, and to the north, west and east the hunting is excellent. Here moose, elk and caribou are to be found in abundance.

Having finished the retracement of the meridian, the party moved southerly a distance of over sixty miles down the old Oak Point trail to resurvey township 21, range 4, west of the principal meridian. This township is occupied principally by settlers from the peasant districts of old France. These people are engaged principally in mixed farming, and, although commencing in a small way, they are working with an industry and perseverance which will make homes in the near future. The crops in this district, though small in extent, were harvested early, and all were making preparations to cultivate an increased acreage during the coming year.

On November 8 this work was completed, and I drove westerly, striking the old Fairford mail trail at Moosehorn bay, on the east shore of lake Winnipeg. I proceeded to Lower Fairford, where I crossed the river and camped about six miles north between the north limits of Indian reservations Nos. 48 and 50, where my instructions called for the survey of about five miles of road, and the resurvey and tying in of several section lines to these reserve boundaries in townships 31, ranges 8 and 9, west of the principal meridian.

The country immediately north of this work is thickly wooded with poplar. The land, generally speaking, is level, and averages four to six inches of black loam with clay loam subsoil. The extensive grazing lands and hay meadows bordering lake St. Martin make this pre-eminently a stock-raising country. Many excellent homesteads are still available. During the winter months fishing is the main industry, the Indians and the half-breeds making from fifty to two hundred dollars per month on an initial investment of a few nets and a dog train for hauling the fish to the warehouses of the several trading stations along the line of railway.

These reserves are also rich in natural resources. Here, however, the manufacture of many thousands of pairs of moccasins has made the moose and elk much



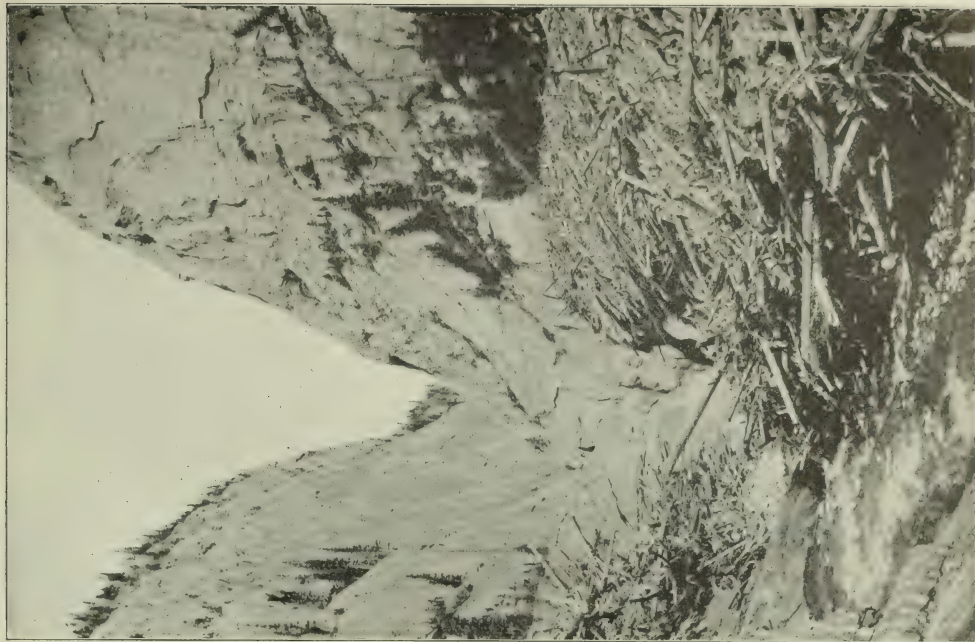


Photo by H. Matheson, D.L.S.  
Fiddle Creek Canyon from the South, Looking down stream.

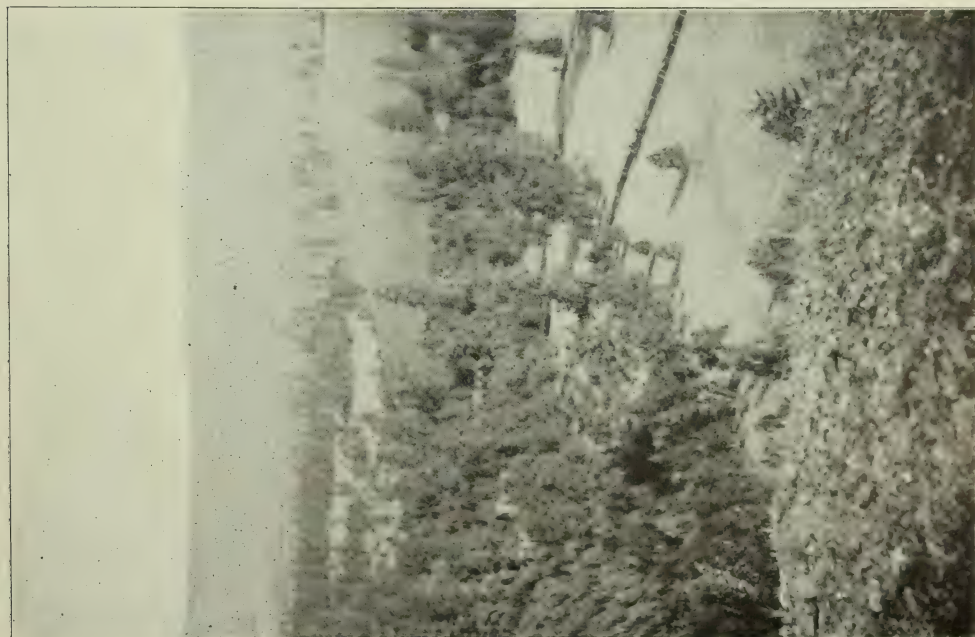


Photo by C. H. Taggart, D.L.S.  
Grand Prairie District in Twp. 13 R. 16, West of the Sixth Meridian.







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scarcer, in the immediate neighbourhood, than in former years. For the settlers who do not wish to fish during the winter, the cordwood industry and the quarries of the Manitoba Gypsum company give ready employment.

It is most gratifying to note the change for the better coming over the Indians on these reserves. Each family has its house, garden and oxen or horses, and from 6 to 30 head of range cattle. The younger people nearly all read, write and speak both English and an Indian dialect, and often German or French, being excellent linguists. They are also all fond of music. The men all work from four to six months each year, for the trading companies, or are engaged in fishing or on railway location and construction.

This work was completed on November 25, just as the river was fit for crossing. My party was at once discharged and the outfit stored for winter, and with my assistant I proceeded by rail to Eriksdale to retrace Swan lake, in townships 21, ranges 5 and 6, west of the principal meridian. There is substantial evidence that the water of this lake, which has no visible outlet, has lowered at least six feet during the past twenty years. In the vicinity the homesteads have all been taken up and the settlers are making remarkable progress in mixed farming, with Winnipieg as a market. The land is excellent, and wild hay plentiful. Here again the cordwood industry is in evidence during the winter.

The traverse of the main lake was completed about December 21, and I returned to Winnipeg to prepare office returns for a couple of weeks before joining Mr. Rolfson as assistant on northern surveys.



## APPENDIX No. 49.

## REPORT OF C. H. TAGGART, D.L.S.

## SURVEYS IN THE KAMLOOPS DISTRICT OF THE RAILWAY BELT, B.C.

OTTAWA, ONT., February 26, 1913.

E. DEVILLE, LL.D.,

Surveyor General,

Ottawa, Canada.

SIR,—I have the honour to submit the following general report of my survey operations in the Kamloops district, in the railway belt, British Columbia, for the season 1912.

As soon as possible after the receipt of my instructions, I left for Kamloops, the point of organization, arriving there on Sunday, April 28.

Kamloops is a flourishing town of about 5,000 inhabitants, beautifully situated at the confluence of the North and South Thompson rivers, and is termed the 'Inland capital of British Columbia.' The surrounding country is known as the 'dry belt,' owing to the small amount of precipitation. Its elevation is 1,160 feet above sea-level, and the climate is very dry and invigorating, making it a pre-eminently desirable resort, especially for those suffering from pulmonary troubles.

The city had its start around a Hudson's Bay company's post, about one hundred years ago, and during the past summer celebrated its centenary in a most fitting manner. Many demonstrations of the old days were seen, which, when compared with to-day, show the development. This place is a divisional point for the Canadian Pacific railway, and in the near future the Canadian Northern Pacific railway line will be in operation, when it is expected that besides being a divisional point for this road, large railway shops will be erected, which will be a great boon to the city. The latter company also intend building a branch line, starting from Kamloops, to penetrate the rich and fertile Okanagan valley. The survey for it was made during the past summer.

The country around Kamloops is generally mountainous, with fertile valleys. The principal crop grown is hay and grain, which is used as feed for the great numbers of cattle and horses for which the district is noted. This industry is to some extent on the decline, and many of the larger ranches are being divided into small holdings, and extensive irrigation systems installed, for the exclusive growing of fruit.

Two fine bridges cross Thompson river; the one to the west of the town gives access to the country west of North Thompson river, and the one to the east joins the city to roads leading into the country east of the river.

The organization of my party was completed on the night of April 30, and on the morning of May 1, I left Kamloops for my first work, the subdivision of the unsurveyed portion of township 21, range 17, west of the sixth meridian, lying east of North Thompson river, and north and adjacent to the Kamloops Indian reserve.

Leaving Kamloops by the new east-end bridge, we entered the reservation for the Kamloops Indians. This large reserve, which extends easterly along South Thompson river for seven or eight miles and northerly along North Thompson river for the same distance, contains a large area of the best agricultural land in the district. Unlike many patches of good land which are of little value, this area has, in Paul creek, an abundance of good water available for irrigation purposes. The striking feature is that very little of the water or the land is being made any use of



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by the Indians, whereas if the same were in the hands of thrifty ranchers great crops would be raised. Here also is to be found some fine grazing land.

The Government wagon and automobile road crosses the Indian reserve boundary into township 21, range 17, close to the river bank, whence it follows the foot of the hills. Between the river and the road is to be seen the new grade of the Canadian Northern Pacific railway, and bordering this are some fine ranches. The first of these is the Longburn ranch, owned by W. R. Austin. This ranch is of considerable size and produces fine crops of hay, grain and fruit.

The greater part of the land subdivided in this township is about fifteen hundred feet above Thompson river. The lands comprising the southwest quarter of section 36, the north half of section 26, the north half and the southwest quarter of section 27, and the southeast quarter of section 28, lie on the lower slope of the rise which forms the remainder of this township. This land is best suited for irrigation purposes in connection with some of the large ranches lying along North Thompson river. The water if brought down from Hefley lakes in township 22, range 16, could be kept well up on the slope at sufficient elevation for distribution over any of the lands on the east side of the river in sections 33, 28, 21 and 20 of township 21, range 17.

The remainder of the land is mostly open, or openly timbered, and has previously been used as range land, for which it is well suited. If sufficient water for irrigation were procurable, some portions of this land would be productive of good crops, but this essential is lacking. However, it is quite possible that the dry farming method would be successful.

In travelling along the road to our next work, in township 22, range 17, the first place of interest was the Anderson ranch, which is a very extensive one producing fine crops of hay, grain, vegetables and small fruit, and raising many head of cattle and horses. I understand that on both the Longburn and Anderson ranches extensive plans are being made for irrigation systems to bring water from Hefley lakes.

Next we passed the Edwards ranch, belonging to Mr. W. R. Austin. The chief product of this ranch is hay and grain, of which excellent crops were seen; vegetables and small fruits are also grown. The ranch is very large and extends to Hefley creek, the waters of which are carried by a system of good ditches and distributed over the land. On this ranch, near the confluence of Hefley creek and North Thompson river, and along the wagon road is to be found a first-class general store, post-office, hall, church and temperance hotel, all the property of Mr. Austin. Here our second camp was erected.

Last October, at Hefley Creek village a fall fair was held in which great interest was manifested. Products of the lands on North Thompson river and its tributaries were exhibited, and an excellent showing was made, which demonstrates the great possibilities of the district.

The land surveyed in this township is mostly rough and rolling and is timbered with fir and pine. In years past cattle have ranged over it, for which purpose it is best adapted. There are some small patches of land which, with irrigation, would be quite productive of hay, grain and perhaps small fruit. Irrigation might be possible by the construction of a long ditch leading from Hefley creek two or three miles farther up stream, but this is impracticable, as the cost would be too great for the amount of land to be watered.

North Thompson river flows through one of the principal valleys of the district, and extends for 200 miles northward, having extensive fertile areas along its banks for a considerable distance, and at present a good wagon and automobile road traverses it. In the near future, however, the Canadian Northern Pacific railway, which is now being rapidly rushed to completion, will be in operation, and will do much to develop the large country it passes through.

Our next work took us along Hefley creek to its source, the Hefley lakes, where subdivision of lands suitable for agriculture in township 22, range 16, was made.



These lands are at a considerable elevation, but judging from the excellent showing of the other ranches along Heffley and Edwards creeks, good crops of hay should be possible. In sections 9 and 22 splendid crops of hay and grain were seen, while vegetables of high order are grown. Some good range land is also to be found.

Heffley creek is a stream from fifteen to twenty-five feet in width and from six inches to two feet deep. It takes its rise in a lake of the same name, at an elevation of about 3,300 feet, and in its descent to North Thompson river falls at the rate of about 200 feet to the mile. It has a maximum flow of about 100 second-feet. Heffley lake is about two miles in length and several hundred yards wide. It affords an excellent storage reservoir for the freshet waters. The water users have co-operated in building a small dam at the lake outlet, but this is quite inadequate; the storage capacity of the lake could be greatly increased, and no water need be wasted. I made some rough measurements, and from these it appears that the lake water could be raised from two and a half to three feet above the present dam without seriously affecting any other interests. It is probable that on the upper reaches of the creek and at Heffley lake the precipitation is about twenty-five inches. The rainfall at the mouth is between eight and twelve inches, with a very light snowfall.

Heffley creek, like most of the streams in the dry belt, is vastly over recorded, but at the same time, with judicious handling there is enough water for all users. The storage, as has been pointed out, is not at its highest efficiency, and the methods used by most of the irrigators are very primitive. Much water is lost through seepage, and this could be obviated by individual irrigation works.

The most tedious and arduous piece of work of the season was the delimitation of the boundary of the railway belt across townships 23 and 24, range 15, and township 24, range 14. In most places this boundary runs over rough mountainous country, thickly wooded, and in some places the ground was covered with a thick layer of wind-fall. This is bad at any time, but at the time of survey, when much rain fell, it was very slippery which made the travelling extra difficult.

Crossing the summit of the high range of mountains from Edwards creek and Kenuff lake valley, a steep descent leads down to the Louis creek valley about twenty-two hundred feet below. This valley is of an average width of about three-quarters of a mile, and in it some fine bottom land is to be found along Louis creek, with some good benches lying nearer the mountains. Nearly all this land has been taken up, and good crops of hay, grain and small fruit are raised. The raising of fruit has not as yet been gone into to any extent, but from the results of some of the small patches seen it is evident that the growing of the small varieties would be very successful. A great drawback to the rapid development of the fruit-growing industry is the distance from any market. The ranchers, here, therefore, produce such crops as can be fed to cattle, sheep, etc.

The main tributaries to Louis creek are McGillivray and Cahilty creeks. On McGillivray creek a small saw-mill is in operation, the water of the creek being used for power. It is possible that a much larger power could be developed.

Cahilty creek, the main tributary of Louis creek, is a torrential mountain stream rising in the highest hills of the Louis creek drainage area, and discharging into Louis creek at an elevation of about 2,000 feet; its waters are used during the summer months for irrigation purposes. The supply is more than enough for all possible users, its maximum flow being about 400 second-feet. The water could be used to good advantage for power. Cahilty lake, about six miles from the mouth, affords excellent storage for the spring freshet. A narrow canyon through which the creek flows at the outlet of the lake could easily be dammed and a mean flow of from 25 to 35 second-feet procured.

I am indebted to the Hydrographic Survey department, under the supervision of Mr. P. A. Carson, D.L.S., for the information regarding flow and record of Heffley and Cahilty creeks.



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In conjunction with the survey of the limit of the railway belt, all lands suitable for settlement in the valleys of Feadar and Cicero creeks, in township 24, range 15, and townships 23 and 24, range 14, were surveyed.

The completion of the survey of the belt limit brought us down to the Adams lake valley, about three and a half miles from the landing on Agate bay. Lying along Pass creek some good agricultural land is to be found. Squatters are located on most of it, but they cannot get entry, owing to the fact that all the unoccupied land within the railway belt in this valley is a timber berth. In this valley, in section 1, township 25, range 14, a small survey was made to tie in the Homestake group of mineral claims. These claims are not in operation, for the reason that the copper ore is not of sufficiently high quality to warrant the excessive cost of transportation to the railway.

A good wagon road has recently been constructed, branching off the Louis creek road at Blucher Hall post-office, and after following the Adams lake valley, terminates at the landing on Agate bay. Good crops of hay and grain were seen, and the yield of potatoes, etc., was fine.

Our next work was in what is known as the Back valley, township 20, range 15, and to reach it we were obliged to return to Kamloops, where we arrived at noon on October 23. After stocking up with supplies and getting the outfit in condition for winter weather, we left Kamloops at noon on the following day, taking the wagon road following South Thompson river for five or six miles to where it branches, leading into the Harper ranch. This is an old and extensive ranch, and is considered one of the best in the district. The land is very productive of hay, grain and vegetables, and a considerable amount of fruit of good quality was seen. At one time as many as three thousand head of cattle were handled on this ranch, but to-day from nine hundred to one thousand is the greatest number that can be successfully cared for, owing to the fact that the range land is being more and more cut off as the country is settled, and is not as productive of bunch grass, owing to many years of grazing, and also during the past few years the winter seasons have been more severe and the snowfall greater, necessitating the feeding of the stock for a much longer period. An average of about one ton of fodder per head is required to winter stock successfully. In the winter of 1911-12 feeding had to be started in November, whereas in an ordinary year previously, feeding was seldom started before January 1, and sometimes not before the 15th.

These statements may also be applied to the whole district.

From the Harper ranch to Pinantan lake the road rises rapidly and crosses the high range of hills forming the north limit of the South Thompson valley. On the north shore of Pinantan lake the first ranch in the Back valley is seen, and following this lake easterly, and along Paul creek, numerous ranches are located. Good crops of hay and grain were seen, for the maturing of which no irrigation was used.

A much better route for reaching this valley is now available. A new wagon road which has been completed this winter branches off the North river road at the crossing of Paul creek, and following the creek passes close to Paul lake and enters township 20, range 15 in section 31. The road then follows along the creek from the lake to near the west end of Pinantan lake, where it connects with the old road. This route is preferable, as there are no steep grades like those on the old road.

The work in this township consisted in the establishment of the north boundary of the township as far as the northeast corner of section 31, and running the meridional section lines to monuments established by previous surveys. The lands surveyed are mostly high and rolling, openly timbered with fir and pine, and a thick growth of underbrush. They cannot be said to be farming lands, although some small patches of good land are to be found. The district is best suited for ranching. North of the north boundary of this township is the Niskonlith forest reserve.

Having completed the survey in township 20, range 15, we moved camp to Trapp lake, township 17, range 17, where we arrived on November 9, and proceeded to subdivide a tract of range land in the eastern portion of the township. We also traversed



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Trapp lake, and resurveyed fishing stations numbers two and three for the Kamloops Indians. The land subdivided is mostly open and rolling, and ordinarily is not productive of any kind of crop, owing to the lack of water. In my report of 1911 can be found a detailed report of this valley.

Having completed work in this township on November 20, we moved to township 18, range 18, where a portion of the township lying east of the Long Lake forest reserve was subdivided. This was completed on December 15, and on the following day we again arrived in Kamloops, where we took train for Chase, a small thriving town, situated on the Canadian Pacific railway, at the outlet of Little Shuswap lake in township 21, range 13, west of the sixth meridian.

This town possesses a large saw-mill, fitted with the most modern machinery, and operated by the Adams River Lumber Co., and on all sides can be seen the results of a progressive lumber industry. There is also a splendidly-appointed hotel which is not surpassed in towns many times the size of this one. During the summer months many tourists and commercial men make it a point to arrive in Chase to spend Sunday. Boating and excellent fishing are to be had on the lake.

My instructions called for the establishment of the east boundaries of section 25 and the south half of section 36, and the north boundary of section 25. This work proved to be difficult, owing to the fact that the lines ran over a very steep rocky mountain, which was blanketed with snow several inches deep, making it slippery and dangerous.

Having completed this piece of work I decided to suspend operations owing to the lateness of the season and the coming of severe weather. I accordingly returned to Kamloops on Saturday, December 21, paid off the party, and on the 23rd stored the outfit for the winter. On the 26th, having closed up all business in connection with the season's operations, I left for Ottawa, where I arrived on December 31.

The weather conditions throughout the season were much out of the ordinary, and most unfavourable for survey operations owing to excessive rains during the months of June, July, August and September. No real warm weather was experienced. At the outset of the season things looked very bright for the farmer, especially those who are not so fortunate as to have plenty of water for irrigation. Good crops could easily be raised on any of the land, which in an ordinary year would be baked and cracked from lack of water and from the extreme warm weather, making growth impossible. When the crops of hay and grain, which were excellent throughout the district, were ready for harvest and the rains continued, great disappointment was felt, and tons of hay and grain were ruined before it was got into the stack.

In speaking with one man, who has been ranching in the district for the past forty years, he said:—

‘Had any one asked me some years ago if we would ever receive too much rain in the dry belt, I would have said, emphatically, “No,” but I will admit I would have been wrong, for this year we have had far too much. If in every year we were to receive but half the amount that fell this summer, all the bottom and bench lands would produce good crops, and without irrigation. I have put in a crop on my ranch annually for the past thirty-seven years, and have never seen as much rain. The climate is certainly changing.’

Two heavy cloud bursts were experienced during the summer, and many heavy thunderstorms. During one of these, which occurred after all hands had rolled in for the night, we were awakened by the falling of a thirty-inch fir tree, which fell parallel to three tents in which five men were asleep; had it come but ten feet to the right all five certainly would have been killed.

I have the honour, to be, Sir,

Your obedient servant,

C. H. TAGGART, D.L.S.



## APPENDIX No. 50.

## ABSTRACT OF THE REPORT OF C. M. WALKER, D.L.S.,

## MISCELLANEOUS SURVEYS IN SOUTHERN ALBERTA.

According to instructions, I procured my outfit at Calgary and, having shipped it to Medicine Hat, I took the trail there leading to township 2, range 6, west of the fourth meridian where my first work lay.

During the summer and fall of 1911, this old trail running south from Medicine Hat, was surveyed and graded to some extent, an effort being made to follow the regular road allowance where at all possible. Naturally, many steep grades resulted, so that in wet weather the present road is almost impassable with any load. At the present time this is somewhat of a hardship for the settlers to the south, many of whom are compelled to haul their grain, produce and supplies over this road for sixty or seventy miles. However, when grading is completed and culverts and bridges put into proper shape, a fairly good and direct highway will result.

Arriving in township 2, we immediately proceeded with the retracement survey.

As a general thing, the mounds of the previous survey were found on the ground in a more or less obliterated condition and, in every case, were renewed, but many of the original iron posts were missing.

The greater part of this township is gently rolling prairie, quite suitable for mixed farming. Those sections, however, adjoining Milk river, namely sections 18, 7, 8, 5, 4, the south-west quarters of sections 9 and 3 and portions of the southern half of sections 2 and 1, are of little use. Several sections in the northeastern portion of the township, namely, sections 25, 35 and 36, and the eastern half of 34, are also so much cut up by bad lands as to be of little value for farming.

Practically all of the available land in this township has been taken up either as homesteads or pre-emptions.

During June of 1912 the crops appeared to be in splendid condition and gave promise of an abundant harvest. In the preceding two years, however, the crops were failures, due to drought and early frosts.

Large areas of land were under cultivation in this district, this season, the different grains being wheat, oats and flax. Of these three, flax appears to be the best adapted to local conditions.

The climate is not at all suitable for corn, even as green feed, but, on the other hand, small vegetables of an exceptionally good quality and of considerable variety are grown. Potatoes especially do exceedingly well. At present, on account of the long haul to market, small vegetables are raised purely for home consumption, but in the event of a railroad being constructed through the immediate neighbourhood, and several are proposed at present, market gardening should prove to be a very lucrative business.

The homesteaders in township 2 are principally Swedish Americans, many of them having proved up, and advantageously sold their homesteads in the western States before coming to this country. Consequently the buildings in the neighbourhood are of a somewhat better class than is usually found on the average homestead.

Mixed farming is carried on to some extent, the stock being of medium quality; all the range land being taken up under lease, the amount of stock for the individual settler is limited to his own homestead and pre-emption.

A post-office, on section 10, and a school on section 15, have been opened up recently and prove great conveniences to the homesteaders of the township.



The soil is a good variety of clay to clay loam, though in the near vicinity of Milk river valley much sandy loam and sandstone rock appear on or near the surface.

Sloughs are to be found in different parts of the township, which provide water and a fair amount of slough grass for stock. A number of the settlers have obtained good and abundant supplies of water by sinking wells from fifty to sixty feet, while others use water from surface wells placed in the vicinity of sloughs.

Very little alkali is in evidence anywhere in the township, with the exception of the bad lands previously referred to.

Township 1, range 6, is of a similar nature to township 3. It is of a gently rolling nature, the exception being that portion included in the Milk river canyon, which cuts off most of the northeastern part of the township.

The soil in this township is not of so good a quality as that of township 2, being of a harder nature, with considerable alkali in evidence.

The whole township is under lease as range land, which is the only thing it is suitable for, and consequently no settlements of any kind have been made therein.

In addition to Milk river, which traverses township 1, a small stream known as Kennedy creek is to be found flowing southeast from the central portion of the township. By allowing the water from this creek, which is more or less alkaline, to seep through into wells placed near at hand, drinking water is obtained.

The township affords a fair range for stock, with a constant water supply in Milk river and Kennedy creek. It appears, however, to be suited for no other purpose.

Though Milk river itself at this point is an insignificant stream, its valley attains huge proportions. The river flows sluggishly along the bottom of a valley, some four hundred feet below the prairie level, and varies from fifty to two hundred feet in width, ordinarily. On the other hand, the sides of the valley are from one to four miles apart. These sides are composed chiefly of bare clay banks with, here and there, projections of sandstone. Huge clay buttes are much in evidence, along the valley, often running up to the prairie level, then dipping down to the level of the river again. These bad lands extend from one to two miles back from the river on either side, thus rendering a considerable portion of the country useless.

Along Milk river valley, a considerable quantity of cottonwood is to be found, both large and small. The latter provides for fence posts, &c., needed by the settlers. The larger trees are of no value, since the labour of getting them out of the valley is excessive, packing being the only available method.

Along the sides of the valley, many seams of coal are to be seen. These seams appear to lie in planes parallel to the prairie level and extend along the sides of the valley for miles. The layers vary in thickness from three to ten feet and, when the outside surface has been removed, the result is a fair sample of lignitic coal, which makes a hot fire and leaves little shale, though much ash. This coal proves to be a convenient and cheap fuel for the needy homesteader.

Having completed the required surveys in townships 2 and 1, range 6, we drove back to Medicine Hat and shipped our outfit to Banff, where our next work lay.

Our first work there consisted in locating a cemetery and in running traverses for the determination of other land suitable for the extension of the town plot, to the south and east.

An investigation survey was then made to ascertain what surveys had really been made in the villa lot section, years ago. As a number of buildings had been erected in this section, they had to be located on the ground. Traverses of all the roads in this part of the town, along which buildings or improvements were found, were made and portions of those ranges in which improvements were found were then posted, by means of information obtained from these traverses.

Intermittently with this work, we were engaged on a retracement survey of the Banff town plot, this survey calling for the posting of all corners of all lots in the plot.





Columbia River at Revelstoke.

Photo by E. Deville, D.T.S.



Shuswap Lake at Sicamous.

Photo by E. Deville, D.T.S.







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Due to the absence of governing posts in some of the blocks, a number of buildings have been erected over the street line or over lot lines.

In the case of blocks, with curvilinear boundaries, no posts or marks were to be found on curved portions to indicate in any way that a previous survey had been made.

Additions were made to the town plot, comprising eight new blocks, namely Nos. 28, 29, 30, 31, 32, 33, 34 and 35.

Of these extension blocks, the two most desirable are Nos. 34 and 35, both of which contain some very choice lots which are very convenient to the main portion of the town.

Having completed the town plot and extensions as described, my next instructions called for a traverse and levels over all the roads and paths for a distance of six miles out of Banff.

In doing this work, the following roads and paths were traversed and levels were taken along the centre of the roads at 100-foot stations:—

Road to Sundance canyon.

Spray River road.

Loop drive.

Corkscrew drive.

Anthracite road to Anthracite and return.

Lake Minnewanka road to Vermilion Lake road.

Mountain avenue.

Sulphur Mountain bridle path to top of Sulphur mountain and observatory.

Tunnel Mountain bridle path to top.

In the case of the last two roads, vertical angles were read instead of levels.

Having completed the work for which I had instructions, I disbanded the party on December 15.



## APPENDIX No. 51

## REPORT OF J. N. WALLACE, D.L.S.

LEVELLING ALONG BASE AND MERIDIAN LINES IN SASKATCHEWAN AND ALBERTA.

CALGARY, ALTA., March 31, 1913.

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa, Canada.

SIR,—I have the honour to submit the following report on levelling operations during the season ended March 31, 1913.

In regard to level work done along the meridian and base lines surveyed last season, considerable progress has been made not only in a large additional mileage of levels, but in improved field work, and in the methods followed in recording the level notes and arranging the results. As the system of levels is necessarily built up from the south to the north, the new lines run each year are wholly dependent for their datum on the lines which were run farther south in previous years. The base lines being the pioneer lines of the whole system of survey, their very nature necessitates that the levels taken along them, while they are being surveyed, must be dependent on themselves. In the country where these lines are being surveyed there is, in fact, practically no other feasible route for running independent lines of levels. Occasionally a line can be run over the ice of some large river in winter, and such have been already utilized. Railway lines, which are the routes universally used to run long lines of levels in settled country, do not exist where base lines are being surveyed. The railways follow comparatively far in the rear, and such has always been the case.

It is necessary, therefore that as great accuracy as the field conditions of an unsettled district will allow be aimed at in these levels along base lines, and further that, as opportunities arising from new railways or other causes occur, these should be utilized to run independent lines of precise levels which, running north and crossing former base lines, even though at widely separated points, will cancel the accumulation of errors in the base lines. By this means, while a certain considerable distance must always intervene between new base lines and the nearest precise elevation, and while from the nature of the case, these new base lines must carry a heritage of error from the intervening base lines, yet if the lines of precise levels are extended continually north, even though always in the rear, this heritage of error will not increase, but will be cut out in the southerly base lines as quickly as it increases in the northerly ones.

As may readily be understood by consideration of the circumstances, the levels run along base lines afford the very first information of elevations of the various features of the country. These levels suddenly change a condition of affairs in which elevations were wholly unknown to a condition where they are known with a high degree of accuracy. The lines of levels are themselves always run twice, each mile being run in opposite directions, and if these duplicates do not agree within 0.10 feet to a mile, the mile must be levelled over again. In practice, this limit is never exceeded, and the duplicate lines very seldom show even this discrepancy.

The additional mileage of levels run along meridians and base lines in the year ended March 31, 1913 is as follows:—



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	Miles.
Along and west of the principal meridian.. . . .	597
"          "          second          "          . . . . .	156
"          "          third          "          . . . . .	156
"          "          fourth          "          . . . . .	282
"          "          fifth          "          . . . . .	156
"          "          sixth          "          . . . . .	144
	<hr/>
	1,491
Run in previous years.	2,913
	<hr/>
Total.	4,404

Three thousand three hundred and forty miles of this total of 4,404 miles has already been connected either to sea-level datum or to some railway datum closely approximating sea-level, while the remaining 1,064 miles have not yet been connected to any known datum. Of this unconnected mileage of levels, about 250 miles are situated in a district extending 50 to 100 miles northwest of Edson on the Grand Trunk Pacific railway, which is the nearest present railway point; about 100 miles are along three short base lines near the foot-hills of the Rocky mountains, 100 miles northwest of Calgary, and the greater part of the remainder is in the district north and west of lake Winnipeg.

The 3,340 miles of levels which have already been connected to a known datum are spread over a country extending from eastern Manitoba to western Alberta. To give some idea of the extent of the country through which they run, it may be mentioned that, using the water of lake Winnipeg for a connection of 60 miles, there exists a continuous line of levels from the intersection of the principal meridian and the international boundary, in southern Manitoba, to the extreme northwest of Peace River block, a length of 1,520 miles, every mile of which, except about 50 miles along one railway in Manitoba, has been run along some meridian or base line, and the north-westerly end of this connection is over 400 miles in advance of any railway.

The longest line of levels in one absolutely straight line occurs on the fourth meridian, along which continuous levels have been run from township 60, south of Cold lake, to township 115, on the south shore of Athabaska lake, a distance of 330 miles.

Apart from the levels along meridian and base lines, but connected with the same system, the following lines of levels were run during the past year:—

	Miles.
(1) From Athabaska Landing to the crossing of the fifth meridian, along Athabaska river.. . . .	70
(2) From Edmonton to Athabaska Landing, the southerly part along the travelled highway, the northerly part along the Canadian Northern railway.. . . .	95
(3) From Prince Albert to Hudson Bay Junction, along the Canadian Northern railway.. . . .	162
(4) From Warman to Islay, along the Canadian Northern railway	193
(5) From Prince Albert to Warman, along the Canadian Northern railway.. . . .	73

The total length of all these is 592 miles. [They may be described as forming a line from Hudson Bay Junction via Prince Albert, Warman, Edmonton and Athabaska Landing to the fifth meridian where it crosses Athabaska river, except a gap of 145 miles between Islay and Edmonton.]

These lines, except the first, are all run as precise lines of levels, the instruments used being a precise level of the United States Coast and Geodetic survey pattern



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and precise rods graduated into yards, tenths and hundredths of yards. The graduation of the rods is practically of the same pattern as used on precise meter rods. The smallest graduation on the rod is one-hundredth of a yard, the readings being estimated to thousandths. Three wires were read, as usual, the sum giving differences of elevation in feet. The readings of the three wires at each sight were read over again if the difference between the wire intervals exceeds three-thousandths of a yard.

All lines were run independently in both a forward and backward direction. The limit which was set is expressed by the formula:—

$$0.017 \text{ feet} \times \sqrt{\text{number of miles}}$$

and unless the duplicate of a mile section agreed within this amount, the section was levelled over again.

The use of a railway handcar was allowed by the Canadian Northern railway, and one was used in all cases. The level party consisted of the leveller, recorder, two rodmen, umbrella man, cook and a man appointed by the railway to watch the handcar, and one man to make bench-marks. The party camped in tents on all the lines. Subsequent experience shows, however, that it is often more economical to board the party at the hotels if there are sufficient small towns. The reason of this is almost entirely due to the expense of a cook for a small party. A cook requires the same wages to cook for one man or a dozen, and allowing for his wages and board the cost of a cook for a party of six men practically amounts to fifty cents per man per day.

In many cases, however, there were long stretches of line with no hotel, necessitating a camp and a cook. In the case of the line from Prince Albert to Hudson Bay Junction there was no town whatever between Tisdale and the Junction, a distance of 73 miles, although there were several lumber camps which, however, were not suitable for the survey party.

The chief trouble about dispensing with a camp and cook is where gaps occur between towns which are too far apart to allow the work to be carried to the middle from each end. One or two such gaps, even though exceptional, would cause serious inconvenience without a camp.

A great trouble on some of the lines was the infrequency of trains, and the number of stopping places where there was no railway agent, and hence no means of knowing when a freight train would pass which could be utilized to move camp. Especially on the Hudson Bay Junction line freight trains were few and far between, and an experience of three months failed to discover any rule by which the arrival of a freight train could be foretold, where there was no agent.

After many efforts to solve the puzzle of the time of arrival of a freight had failed, reliance had to be placed on moving the camp outfit in the baggage car of the daily passenger train. This not only resulted in trying the conductor's temper at the delay but, as the work got farther east, the time of arrival of the train got later each move, until, near the end of the season, it was long after dark when the passenger train picked up the camp outfit, and darker still when it deposited it at some flag station with no accommodation for the party until the tents were pitched. It would be a mistake to suppose that such lines of levels have no transport difficulties.

The matter of permanent bench-marks in a district where there are no structures of stone or concrete is best arranged by establishing special ones. These were made by building a small concrete pillar. A hole about a foot and a half in diameter and 6 feet deep is dug with a crowbar and a shovel with an 8 foot handle, known as a spoon. A footing of concrete having been placed in the bottom of the hole, a hollow box made of four planks, 1 foot square at the base and 7 inches square at the top, is then placed on the footing and the box is filled with concrete. A brass plate with a shank attached is sunk in the top of the pillar and the elevation of this recorded after the pillar has been filled in and had a week or so to settle and become firm. Such



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a concrete pillar is much the best kind of bench-mark in the absence of a substantial bridge or building, but the size used is somewhat small, and in the latter part of the season a larger size was made. It was frequently very difficult to get sand and gravel. During the season, 77 such pillars were made.

In addition to establishing the permanent bench-marks at every station and, in many cases midway between stations, temporary bench-marks were left at the end of every mile. These consisted of railway spikes eight inches long and half an inch square driven into telegraph poles. They were established chiefly as temporary marks for checking each day's work but, although not really stable, yet in the case of poles situated on locally high ground where there is not much moisture in the soil to cause heaving by frost, they have a decided value as a future reference, where precision is not required.

The only intermediate sights recorded were the elevations of the base of rail at each railway station, but in the future it is intended to record the elevations of all important features crossed, such as streams.

The following is a short description of each of the several lines of levels which were run:—

1. *Athabaska Landing to the fifth meridian, 70 miles.*—This line was necessarily levelled in winter. It was run by Mr. de la Condamine between February 5 and March 6, 1912. The bench-marks are marks left on the various stopping-houses, easily found but not of a very permanent character. It is intended to replace them by more permanent marks. The party consisted of a leveller, two rodmen, a cook and a teamster with one team. Camp was moved with the aid of passing freighters. The line of levels was commenced at a Canadian Northern railway bench-mark at Athabaska Landing and ended on the bench-marks at the southerly end of the fifth meridian levels. These last were run in the year 1911 along this meridian from Athabaska river to Peace river, a distance of 315 miles.

The line up the river from Athabaska Landing at present forms the only connection which supplies a known datum for all levels in the Peace River district.

2. *Edmonton to Athabaska Landing, 95 miles.*—This was commenced on May 3 and ended July 23.

It follows the travelled highway for 61 miles northerly from Edmonton, and then follows the Canadian Northern railway, which at that time was constructed but not open for traffic. Owing to the rough surface of the southerly part of the route, progress was much slower than is the case where running a line of levels along a railway. Bench-marks were left at a distance of three to four miles apart. They consist of three-inch galvanized iron pipes sunk in concrete foundations four feet below the surface, the top of the cap of the pipe in each case appearing ten inches above ground and being the recorded elevation.

The probable error of the mean of a mile section, as computed from the discrepancies between the forward and backward lines of each individual section is 0.0040 feet. The total discrepancy for the whole line is 0.104 feet.

3. *Prince Albert to Hudson Bay Junction, 162 miles.*—This line was commenced on August 2 and completed on October 17. Between Prince Albert and Tisdale the Canadian Northern railway, over which the line of levels was run, passes through a partly open country. From Tisdale to the end of the line the country is thickly timbered, affording shelter from wind, a very important consideration. The line of levels was run by Mr. de la Condamine from Prince Albert to Star City (76 miles), which he reached on September 6. On that date he left camp to measure a precise base line with the invar apparatus at Salmon Arm, B.C. This base, which is 5.1 miles long, was measured in connection with the triangulation of the railway belt, and occupied Mr. de la Condamine till the end of the season. When he left I continued the line of levels for the remaining 86 miles to Hudson Bay Junction, reaching there on October 17.



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Permanent bench-marks, consisting of concrete pillars, have been established close to every station named in the railway time table, whether the district is settled or not and, in addition, many such pillars have been placed midway between stations, and frequent marks have been left on trestle bridges.

This line of levels shows the smallest probable error, for a mile section, of any line run this past season, being 0.0030 feet for the 86 miles I levelled, and 0.0033 feet for the 76 miles levelled by Mr. de la Condamine. The time taken was 76 days from the day of commencement to the day of ending. This is at the rate of 64 miles per month. The average run of a fair day was seven to eight miles of single line. Conditions of transport caused a good deal of delay. On the other hand, few days were lost owing to high winds, as the line was sheltered. In the whole 162 miles I had to re-run only 4 miles, and Mr. de la Condamine only six miles. In nearly every one of these miles the limit of 0.017 feet was largely, exceeded, and was due to some obvious unfavourable cause which would have had practically as great an effect whatever the speed. The discrepancy for a mile exceeded 0.010 feet in only 26 per cent of the whole mileage.

It has been stated by more than one level organization that a small percentage of re-running indicates excessive care and slowness, and that the speed should be such that ten per cent of the line should require to be re-run. In other words that if a certain limit of error is set, it should be exceeded in one mile in ten in order to adjust the speed to the extreme limit. I do not follow the reasoning which instructs a leveller not to admit miles having a discrepancy greater than a certain limit into his final returns and yet instructs him to go so fast that he should exceed this limit occasionally. With a limit so high as 0.017 feet  $\times \sqrt{\text{number of miles between bench marks}}$ , say four miles apart or a total of 0.034 feet, it seems that a speed deliberately set to exceed this limit would be such as to cause detriment to the precision. The discrepancy found is not, by any means, in itself a guarantee that the apparent precision is really attained, if the speed is set beyond the extreme limit of the observer's skill. At the end of his season he has admittedly gone beyond the limit of his skill in ten per cent of the work, and the fact that such results are cut out of the final line appears somewhat like a method of rejecting certain observations in order to reduce the final probable error.

Whatever may be said in favour of instructing a leveller that he should deliberately go so fast as to exceed the limit allowed in ten per cent of the mileage, it is an instruction which does not appear in many of the best level organizations.

*Warman to Islay, 193 miles; and Prince Albert to Warman, 73 miles.*—These two lines were run by Mr. L.O.R. Dozois, D.L.S. The first was commenced at Warman on June 5, 1912, and ended on September 24. Mr. Dozois then proceeded to Prince Albert and levelled southerly to Warman, where he ended the season's work on October 26. The running of this last line closed a gap in the levels, and formed a continuous line of levels from Hudson Bay Junction to Islay, 428 miles in all.

Along the line west of Warman, bench-marks were placed one at each station and one midway between stations for the first few stations, after which the midway bench-mark was omitted owing to the difficulty of transport of cement, gravel and tools, and, as a compromise, two bench-marks were established near every station. The stations average seven to eight miles apart, and the two bench-marks are placed one about a quarter of a mile east of the station, and the second about the same distance west of the station. The bench-marks consist of concrete pillars in the great majority of cases.

On the line from Prince Albert to Warman the bench-marks are, as a rule, on buildings.

Considerable trouble was caused, especially on the Warman to Islay line, by frequent high winds, the lines being generally over almost open prairie. From Warman to Bresaylor this line gives good results, but west of Bresaylor a marked



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negative discrepancy began to accumulate. This was probably, in a large measure, due to the track being re-ballasted west of Bresaylor. This may have given rise to a persistent settling of the turning points on the rail as the car passed over them in moving forward from one instrument station to another. There undoubtedly might be a tendency this way, but under similar circumstances when running the line of levels from Edmonton to Athabaska Landing, no persistent systematic error was shown to be brought about by this cause, although the track was an entirely new one, and only ballasted with sand a few days previous to the running of the line of levels.

Whatever the cause, the discrepancy is negative almost continuously west of Bresaylor, although the individual intervals between bench-marks, except in a very few instances, are all within the specified limit.

The probable error of the mean of a mile section is 0.0039 feet.

The line of levels from Prince Albert to Warman was run under more favourable conditions as regards absence of wind. The probable error of the mean of a mile section is 0.037 feet. The total accumulated discrepancy for 73 miles is 0.134 feet. This line was run more speedily than any other line, the whole distance, including a day's work in connection at each end, being done in 31 days, between September 26 and October 26.

I have the honour, to be, Sir,

Your obedient servant,

J. N. WALLACE, D.L.S.



## APPENDIX No. 52.

## MAGNETIC OBSERVATIONS.

This appendix contains the results of magnetic declination observations received during the year ended March 31, 1913.

Each observed declination has been reduced to the mean of the month in which the observation was taken by means of the continuous observations at the magnetic observatory at Agincourt.

A table is also given of the results of the observations for the determination of magnetic dip and total intensity taken in the years 1908 and 1910.

## MAGNETIC DECLINATION.

Place.	Tp.	Rge.	Mer.	Date.	Declination.	Observer.
40-00 N.—SE. cor. sec. 16.....	18	1	E.Pr.	May 29	12 34.3	C. F. Aylsworth
40-00 N.—" 16.....	18	1	"	June 3	12 31.6	"
50-00 E.—NE. " 9.....	18	1	"	" 5	12 34.7	"
40-00 N.—SE. " 16.....	18	1	"	May 28	12 25.9	"
At NE. cor. sec. 3.....	16	6	"	July 1	12 46.2	"
7-00 S.—NE. cor. sec. 25.....	25	6	"	Aug. 12	11 58.3	"
21-00 N.—NE. " 24.....	25	6	"	" 12	11 56.9	"
At NE. cor. sec. 4.....	25	6	"	" 27	11 25.5	"
13-00 E.—NE. cor. sec. 3.....	25	6	"	" 29	11 33.2	"
At NE. cor. sec. 9.....	25	9	"	" 26	11 35.1	"
" 11.....	16	11	"	July 1	13 04.0	"
38-00 S.—NE. cor. sec. 35.....	10	13	"	Nov. 22	10 55.9	W. J. Deans.
25-00 S.—NE. " 35.....	10	13	"	" 23	12 48.0	"
57-00 W.—SE. " 1.....	11	13	"	" 25	10 34.6	"
57-00 W.—SE. " 1.....	11	13	"	" 25	10 34.6	"
72-00 W.—NE. " 33.....	10	14	"	Oct. 14	10 57.4	"
40-00 W.—NE. " 32.....	10	14	"	" 15	10 57.1	"
55-00 E.—NW. " 13.....	10	14	"	" 17	9 55.8	"
55-00 W.—SE. " 3.....	11	14	"	" 19	12 41.7	"
45-00 W.—SE. " 6.....	11	14	"	" 21	10 51.4	"
15-00 S.—NE. " 23.....	11	14	"	" 24	10 43.8	"
At NE. cor. sec. 35.....	11	14	"	" 18	11 46.5	"
5-00 N.—NE. cor. sec. 36.....	11	14	"	Nov. 19	11 14.0	"
10-00 S.—NE. " 32.....	10	15	"	" 5	10 44.2	"
55-00 S.—NE. " 18.....	11	15	"	Oct. 25	10 52.1	"
48-00 S.—NE. " 5.....	12	15	"	Nov. 18	10 36.1	"
At NE. cor. sec. 25.....	7	16	"	Sept. 4	8 02.2	"
" " " ".....	7	16	"	" 7	8 23.5	"
70-00 S.— $\frac{1}{4}$ post N. by sec. 24.....	7	16	"	" 11	8 34.0	"
48-00 S.—" 36.....	7	16	"	" 12	7 45.1	"
37-00 N.—SE. cor. sec. 1.....	8	16	"	" 16	8 16.5	"
59-00 S.— $\frac{1}{4}$ post N. by sec. 1.....	8	16	"	" 18	7 25.9	"
25-00 W.—NE. cor. sec. 30.....	7	17	"	" 2	8 26.1	"
At NE. cor. sec. 30.....	7	17	"	" 9	8 46.0	"
6-00 N.—NE. cor. sec. 24.....	9	17	"	" 15	8 36.0	G. A. Bennett.
16-00 N.—" 1.....	9	17	"	" 18	9 25.3	"
38-11 N.—" 25.....	9	17	"	" 27	8 57.2	"
49-00 N.—" 25.....	9	17	"	" 27	8 57.1	"
49-00 N.—" 25.....	9	17	"	" 27	9 06.8	"
25-5 N.—" 1.....	10	17	"	Oct. 7	9 28.2	"
25-5 N.—" 1.....	10	17	"	" 8	8 43.9	"
11-00 S.—" 36.....	10	17	"	" 12	11 09.5	"
57-00 N.—" 13.....	10	17	"	" 13	9 06.5	"
25-50 N.—" 1.....	10	17	"	" 14	8 38.5	"
57-00 N.—" 13.....	10	17	"	" 14	9 06.9	"
57-00 N.—" 13.....	10	17	"	" 14	9 08.2	"
At NE. cor. sec. 12.....	1	1	Pr.	May 19	12 16.4	A. G. Stuart.



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## MAGNETIC DECLINATION.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	Declination.	Observer.
At NE. cor. sec. 12	1	1	Pr.	May 19	12 14.0	A. G. Stuart.
“ “ 13	2	1	“	“ 20	12 06.2	“
“ “ 13	2	1	“	“ 20	12 14.2	“
40.00 N.—NE. cor. sec. 24	3	1	“	“ 24	13 15.2	“
At NE. cor. sec. 25 (trial line)	5	1	“	“ 29	13 02.4	“
“ “ 25	5	1	“	“ 29	13 15.8	“
Centre E. by sec. 36	6	1	“	June 3	12 21.0	“
“ “ 36	6	1	“	“ 3	12 20.9	“
“ “ 24	7	1	“	“ 5	13 11.6	“
“ “ 24	7	1	“	“ 5	13 09.7	“
“ “ 36	8	1	“	“ 7	13 49.5	“
“ “ 25	9	1	“	“ 11	13 55.6	“
“ “ 25	9	1	“	“ 11	13 51.2	“
“ “ 1	10	1	“	“ 12	13 54.4	“
“ “ 1	10	1	“	“ 12	13 55.0	“
“ “ 24 (trial line)	11	1	“	“ 19	13 55.3	“
“ “ 24	11	1	“	“ 19	13 54.6	“
“ “ 13	13	1	“	“ 26	13 23.3	“
At NE. cor. sec. 13 (trial line)	13	1	“	“ 27	13 34.9	“
“ “ 24	14	1	“	July 4	13 37.5	“
40.00 N.—NE. cor. sec. 1	15	1	“	“ 6	13 34.9	“
At $\frac{1}{4}$ post E. by sec. 13	15	1	“	“ 9	14 03.1	“
Centre E. by sec. 1	16	1	“	“ 10	13 10.3	“
“ “ 1	16	1	“	“ 10	13 12.8	“
At NE. cor. sec. 24	17	1	“	“ 22	13 26.2	“
“ “ 13	17	1	“	“ 23	12 57.1	“
10.00 N.—NE. cor. sec. 36	17	1	“	“ 25	12 38.8	“
10.00 N.—“ 36	17	1	“	“ 25	12 37.7	“
At NE. cor. sec. 36	19	1	“	Aug. 3	12 42.2	“
38.00 chs. on E. by sec. 13	20	1	“	“ 6	12 44.4	“
20.00 N.—NE. cor. sec. 25	20	1	“	“ 9	13 13.6	“
“ “ 25	20	1	“	“ 9	13 16.3	“
1.87 N.—“ 13	21	1	“	“ 18	13 21.1	“
“ “ 13	21	1	“	“ 18	13 19.1	“
At NE. cor. sec. 24	22	1	“	“ 22	13 33.0	“
“ “ 25	22	1	“	“ 24	13 41.5	“
At $\frac{1}{4}$ post on E. by sec. 36	23	1	“	“ 30	13 26.5	“
“ “ 36	23	1	“	“ 30	13 27.8	“
60.00 N.—NE. cor. sec. 12	24	1	“	Sept. 2	13 06.2	“
“ “ 12	24	1	“	“ 2	13 05.8	“
30.00 N.—“ 12	25	1	“	“ 7	13 14.9	“
At NE. cor. sec. 13	26	1	“	“ 18	13 09.2	“
“ “ 13	26	1	“	“ 18	13 07.7	“
“ “ 36	27	1	“	“ 24	12 43.5	“
“ “ 36	27	1	“	“ 24	12 49.3	“
Centre E. by sec. 24	28	1	“	“ 27	12 26.0	“
“ “ 24	28	1	“	“ 27	12 24.3	“
“ “ 24	28	1	“	“ 27	12 26.2	“
21.60 W.—NE. cor. sec. 31	60	1	“	Nov. 13	14 24.7	O. Rolison.
“ “ 31	60	1	“	“ 13	14 19.4	“
“ “ 31	60	1	“	“ 13	14 24.1	“
“ “ 31	60	1	“	“ 13	14 24.4	“
“ “ 31	60	1	“	“ 13	14 26.4	“
“ “ 31	60	1	“	“ 14	13 47.7	“
“ “ 31	60	1	“	“ 14	14 37.6	“
“ “ 31	60	1	“	“ 14	14 21.1	“
“ “ 31	60	1	“	“ 14	14 22.1	“
“ “ 31	60	1	“	“ 14	14 04.1	“
32.50 W.—“ 32	60	1	“	Oct. 25	14 37.2	“
59.42 W.—“ 32	60	1	“	“ 29	14 08.0	“
21.66 W.—“ 31	60	1	“	Nov. 13	14 29.9	“
“ “ 31	60	1	“	“ 13	14 26.5	“
“ “ 31	60	1	“	“ 13	14 23.3	“
12.79 N.—“ 12	61	1	“	June 14	14 18.7	G. H. Herriot.
39.25 N.—“ 24	61	1	“	“ 19	13 35.6	“
16.53 N.—“ 24	62	1	“	“ 28	14 06.5	“
30.68 N.—“ 21	63	1	“	July 10	13 42.9	“
59.75 W.—“ 32	64	1	“	Aug. 15	12 28.7	O. Rolison.
4.55 N.—“ 24	66	1	“	“ 7	13 58.6	G. H. Herriot.
76.82 N.—“ 13	67	1	“	“ 14	11 53.0	“



## MAGNETIC DECLINATION.—Continued

Place.	Tp.	Rge.	Mer.	Date.	Declination.	Observer.
78-91 N.—NE. cor. sec. 24.....	68	1	Pr.	Aug. 24	12 38-1	G. H. Herriot.
58-45 N.—“ 13.....	70	1	“	Sept. 10	14 26-3	“
35-00 N.—“ 24.....	70	1	“	“ 11	14 50-0	“
26-29 N.—“ 1.....	72	1	“	“ 30	14 14-6	“
“ “ “ 1.....	72	1	“	“ 30	14 11-5	“
76-50 N.—“ 12.....	72	1	“	“ 30	11 54-9	“
At NE. cor. sec. 33.....	17	2	“	Dec. 28	12 37-3	G. A. Bennett.
“ “ “ 3.....	18	2	“	“ 26	12 37-3	“
“ “ “ 9.....	18	2	“	“ 27	12 39-4	“
16-00 N.—NE. cor. sec. 7.....	21	2	“	Aug. 26	13 37-3	“
“ “ “ 7.....	21	2	“	“ 26	13 36-9	“
At NE. cor. sec. 7.....	21	2	“	“ 26	13 35-3	“
16-00 E.—NE. cor. sec. 7.....	21	2	“	“ 26	13 30-9	“
“ “ “ 7.....	21	2	“	“ 26	13 30-8	“
67-42 W.—“ 35.....	56	2	“	July 16	14 01-1	O. Rolfson.
At NE. cor. sec. 33.....	56	2	“	“ 17	14 12-8	“
29-87 W.—NE. cor. sec. 31.....	56	2	“	“ 19	14 53-0	“
24-42 W.—“ 34.....	64	2	“	Aug. 19	14 03-3	“
47-50 W.—“ 35.....	60	3	“	Nov. 22	14 14-3	“
10-00 N.—“ 22.....	21	4	“	“ 27	13 48-0	A. G. Stuart.
“ “ “ 22.....	21	4	“	“ 27	13 46-8	“
5-00 S.— $\frac{1}{4}$ post E. by sec. 23.....	21	4	“	“ 5	13 49-4	“
“ “ “ 23.....	21	4	“	“ 5	13 49-0	“
At NE. cor. sec. 35.....	64	4	“	Sept. 3	14 38-2	O. Rolfson.
At NE. cor. sec. 5.....	22	5	“	Oct. 4	13 16-1	C. F. Aylsworth
4-00 N.—NE. cor. sec. 4.....	22	5	“	“ 30	13 26-2	“
23-00 W.—“ 21.....	22	5	“	“ 30	13 26-1	“
3-00 S.—“ 19.....	22	5	“	“ 30	13 27-3	“
20-00 E.—“ 19.....	22	5	“	“ 30	13 30-1	“
4-00 W.—“ 3.....	22	5	“	Nov. 5	13 34-7	“
20-00 N.—“ 3.....	22	5	“	“ 5	13 33-9	“
5-00 W.—“ 10.....	22	5	“	“ 6	13 26-4	“
35-00 S.—“ 11.....	22	5	“	“ 7	13 37-7	“
12-00 S.—“ 22.....	22	5	“	“ 8	13 15-8	“
35-00 E.—“ 10.....	22	5	“	“ 9	13 28-1	“
5-00 W.—“ 14.....	22	5	“	“ 11	13 29-0	“
10-00 W.—“ 26.....	22	5	“	“ 28	12 26-9	“
20-00 N.—“ 26.....	22	5	“	“ 28	11 55-6	“
12-00 S.—“ 25.....	22	5	“	“ 29	13 20-3	“
25-00 W.—“ 25.....	22	5	“	“ 29	13 06-0	“
14-00 W.—“ 6.....	23	5	“	Oct. 29	13 23-6	“
At SE. cor. sec. 5.....	23	5	“	“ 26	13 23-8	“
7-00 E.—SE. cor. sec. 5.....	23	5	“	“ 26	13 24-5	“
10-00 W.—“ 2.....	23	5	“	Nov. 26	14 07-8	“
15-00 N.—“ 2.....	23	5	“	“ 26	13 51-6	“
59-67 W.—NE. “ 31.....	60	5	“	Dec. 9	13 47-1	O. Rolfson.
16-70 W.—“ 33.....	64	5	“	Sept. 16	13 48-9	“
26-00 W.—“ 29.....	21	7	“	May 19	13 06-5	G. A. Bennett.
“ “ “ 29.....	21	7	“	“ 19	13 05-4	“
“ “ “ 29.....	21	7	“	“ 19	13 05-6	“
“ “ “ 29.....	21	7	“	“ 19	13 03-5	“
“ “ “ 29.....	21	7	“	“ 19	13 02-9	“
“ “ “ 29.....	21	7	“	“ 19	13 03-9	“
“ “ “ 29.....	21	7	“	“ 19	13 07-6	“
“ “ “ 29.....	21	7	“	“ 19	13 11-8	“
“ “ “ 29.....	21	7	“	“ 19	13 11-0	“
“ “ “ 29.....	21	7	“	“ 19	13 08-0	“
8-00 N.—NW. cor. sec. 36.....	21	7	“	Sept. 3	12 56-9	“
At NW. cor. sec. 7.....	28	7	“	July 29	13 26-7	P. R. A. Belanger.
20-00 S.—NE. cor. sec. 6.....	29	7	“	Aug. 8	13 16-6	“
77-15 W.—NE. “ 36.....	60	7	“	Dec. 13	14 07-2	O. Rolfson.
8-00 N.—NW. “ 36.....	21	8	“	Sept. 3	12 59-2	G. A. Bennett.
24-00 W.—NE. “ 10.....	28	8	“	July 27	13 03-7	P. R. A. Belanger.
15-00 W.—“ 10.....	29	8	“	Aug. 2	13 29-3	“
9-19 W.—“ 35.....	60	8	“	Dec. 25	17 24-7	O. Rolfson.
1-00 N.—“ 31.....	5	9	“	Oct. 1	13 56-5	G. A. Bennett.
“ “ “ 31.....	5	9	“	“ 1	13 58-3	“
38-00 S.—“ 14.....	31	9	“	Nov. 23	13 54-8	A. G. Stuart.
“ “ “ 14.....	31	9	“	“ 23	14 00-8	“
“ “ “ 14.....	31	9	“	“ 23	13 56-3	“
At NE. cor. sec. 30.....	18	10	“	July 16	12 54-1	G. A. Bennett.



## SESSIONAL PAPER No. 25b

## MAGNETIC DECLINATION.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	Declination.	Observer.
At NE. cor. sec. 30.....	18	10	Pr.	July 16	12 58-0	G. A. Bennett.
"    "    "    30.....	18	10	"	"    16	12 58-0	"
22-00 N.—NE. cor. sec. 5.....	21	11	"	"    6	14 03-2	J. Francis.
21-00 N.—"    "    8.....	21	11	"	"    9	14 04-3	"
18-00 W.—"    "    5.....	21	11	"	"   11	13 58-2	"
1-00 N.—"    "    3.....	21	11	"	"   17	13 54-9	"
3-00 N.—"    "   14.....	21	11	"	"   25	13 54-0	"
At NE. cor. sec. 11.....	21	11	"	"   26	14 04-7	"
45-00 N.—NE. cor. sec. 27.....	21	11	"	"   30	13 54-1	"
69-00 N.—"    "   26.....	21	11	"	Aug. 1	14 05-4	"
26-00 N.—"    "   20.....	21	11	"	"    5	13 53-4	"
64-00 N.—"    "   20.....	21	11	"	"    7	13 07-9	"
At NW. cor. sec. 31.....	8	12	"	"   19	14 57-3	P.R.A. Belanger.
At NE.    "    36.....	20	12	"	July 3	14 21-5	J. Francis.
50-00 S.—NE. cor. sec. 7.....	21	12	"	Dec. 26	14 01-9	W. J. Deans.
18-00 S.—"    "    7.....	21	12	"	June 13	14 50-7	J. Francis.
32-00 E.—"    "   16.....	21	12	"	Aug. 28	14 41-2	"
At NE. cor. sec. 18.....	21	12	"	Sept. 18	14 43-9	"
41-00 S.—NE. cor. sec. 36.....	22	12	"	Aug. 20	14 41-2	"
38-00 W.—"    "   19.....	22	12	"	Dec. 31	14 56-7	W. J. Deans.
70-00 S.—"    "    3.....	21	13	"	"   23	14 25-9	"
72-00 S.—"    "    2.....	21	13	"	"   24	15 02-1	"
18-00 W.—"    "    5.....	21	13	"	June 24	15 03-6	J. Francis.
36-00 N.—"    "   13.....	21	13	"	April 24	14 54-6	"
37-50 N.—"    "   25.....	21	13	"	"   25	14 51-3	"
39-50 W.—"    "   35.....	21	13	"	"   26	14 27-4	"
At NE. cor. sec. 34.....	21	13	"	"   28	14 05-3	"
"    "    26.....	21	13	"	May 1	14 27-5	"
15-00 W.—NE. cor. sec. 14.....	21	13	"	"    2	14 44-1	"
27-00 E.—"    "   23.....	21	13	"	"    8	14 44-9	"
32-00 E.—"    "   22.....	21	13	"	"    9	14 45-2	"
26-00 E.—"    "   15.....	21	13	"	"   10	14 48-4	"
68-00 N.—"    "   34.....	21	13	"	"   16	14 34-4	"
41-00 S.—"    "    2.....	21	13	"	"   27	14 59-1	"
47-00 W.—"    "   12.....	21	13	"	"   28	14 51-5	"
55-00 S.—"    "    3.....	21	13	"	"   29	14 56-1	"
17-00 E.—"    "    2.....	21	13	"	"   31	14 49-5	"
10-00 N.—"    "   18.....	21	13	"	June 8	14 46-3	"
19-00 E.—"    "   18.....	21	13	"	"   12	14 44-0	"
25-00 W.—"    "   19.....	21	13	"	"   14	15 23-4	"
60-00 W.—"    "   15.....	22	13	"	"   28	14 08-2	W. J. Deans.
35-00 W.—"    "   36.....	22	13	"	May 15	14 55-5	J. Francis.
45-00 N.—"    "    4.....	22	13	"	"   18	14 47-3	"
20-00 W.—"    "    3.....	22	13	"	"   21	14 30-1	"
38-00 W.—"    "   10.....	22	13	"	"   22	14 41-3	"
9-00 E.—"    "   15.....	22	13	"	"   23	14 41-7	"
8-00 S.—"    "   17.....	22	13	"	June 18	14 58-4	"
40-00 W.—"    "    4.....	22	13	"	"   19	14 44-2	"
17-00 N.—"    "    6.....	22	13	"	"   20	15 15-2	"
At NE. cor. sec. 25.....	21	14	"	"    7	14 50-9	"
"    "    23.....	30	15	"	Dec. 18	15 27-9	G. A. Bennett.
14-00 E.—NE. cor. sec. 8.....	33	19	"	June 17	15 43-7	"
"    "    8.....	33	19	"	"   16	15 38-5	"
8-00 E.—"    "   31.....	19	20	"	Aug. 1	14 09-0	"
34-00 E.—"    "    9.....	37	20	"	July 4	16 52-8	P.R.A. Belanger
At SE. cor. sec. 3.....	38	20	"	"   10	19 10-9	"
8-00 N.—NE. cor. sec. 36.....	19	21	"	"   27	14 28-7	G. A. Bennett.
52-00 N.—"    "   36.....	19	21	"	"   29	14 25-8	"
At NE. cor. sec. 32.....	34	21	"	June 24	16 16-2	P.R.A. Belanger.
15-00 S.—NE. cor. sec. 3.....	35	21	"	"   20	16 12-9	"
15-00 S.—"    "   12.....	55	26	"	July 13	19 33-8	E. W. Berry.
16-00 S.—"    "   23.....	55	26	"	"   31	18 37-8	"
66-00 S.—"    "    2.....	55	26	"	Aug. 8	19 15-3	"
60-00 S.—"    "   30.....	57	26	"	Dec. 28	18 30-8	"
68-00 S.—"    "   29.....	52	28	"	Aug. 22	18 05-5	"
52-00 E.—"    "   19.....	52	28	"	"   26	17 36-4	"
68-00 E.—"    "   23.....	52	28	"	"   29	19 19-6	"
20-00 N.—"    "    4.....	53	28	"	July 18	18 48-3	"
16-00 N.—"    "    3.....	53	28	"	"   22	19 31-3	"
32-00 S.—"    "   15.....	53	28	"	Sept. 9	19 16-2	"
8-00 E.—"    "   33.....	51	29	"	Oct. 5	18 43-5	"



## MAGNETIC DECLINATION.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	Declination.	Observer.
62-00 E.—NE. cor. sec. 32.....	51	29	Pr.	Oct. 10	18 46-0	E. W. Berry.
41-00 S.—“ 1.....	52	29	“	Sept. 17	19 06-0	“
36-00 S.—“ 9.....	52	29	“	Oct. 25	19 32-8	“
41-00 N.—“ 5.....	52	29	“	“ 16	19 11-7	“
At NE. cor. sec. 4.....	28	30	“	“ 25	16 20-6	G. A. Bennett.
“ 4.....	28	30	“	“ 25	16 21-1	“
6-00 E.—NE. cor. sec. 33.....	18	31	“	“ 29	17 41-4	“
At NE. cor. sec. 36.....	18	31	“	“ 31	16 43-7	“
32-00 E.—NE. cor. sec. 32.....	18	31	“	Nov. 1	17 40-5	“
At NE. cor. sec. 36.....	18	31	“	“ 2	16 34-6	“
23-50 E.—NE. cor. sec. 35.....	18	31	“	“ 2	16 50-0	“
10-00 W.—“ 31.....	18	31	“	“ 2	17 36-0	“
48-00 E.—SE. “ 5.....	19	31	“	“ 1	17 35-1	“
At SE. cor. sec. 1.....	19	31	“	“ 1	17 08-1	“
5-00 E.—SE. cor. sec. 3.....	18	32	“	“ 8	17 45-0	“
At NE. cor. sec. 31.....	18	32	“	“ 9	17 53-7	“
At SE. “ 24.....	31	32	“	Oct. 26	17 12-9	“
“ “ 24.....	31	32	“	“ 26	17 06-2	“
45-00 W.—NE. cor. sec. 35.....	18	33	“	Nov. 11	18 05-3	“
12-00 W.—“ 32.....	18	33	“	“ 13	17 58-2	“
40-00 E.—“ 32.....	18	33	“	“ 15	17 57-4	“
50-00 W.—SE. “ 2.....	19	33	“	“ 12	18 09-2	“
30-00 N.—SE. cor. sec. 1.....	19	1	2	Nov. 14	18 04-9	G. A. Bennett.
14-00 S.—NE. “ 28.....	34	1	2	June 10	19 33-9	“
40-00 N.—“ 28.....	34	1	2	“ 11	19 46-8	“
40-00 N.—“ 28.....	34	1	2	“ 11	19 37-1	“
16-67 N.—“ 13.....	61	1	2	“ 26	19 52-0	J. A. Fletcher.
“ “ 13.....	61	1	2	“ 26	19 51-7	“
“ “ 13.....	61	1	2	“ 27	19 50-5	“
“ “ 13.....	61	1	2	“ 27	19 50-1	“
“ “ 13.....	61	1	2	“ 28	19 48-2	“
“ “ 13.....	61	1	2	“ 28	19 48-1	“
36-00 S.—“ 34.....	26	2	2	Sept. 16	19 49-2	B. H. Segre.
20-00 E.—“ 35.....	14	4	2	Aug. 13	17 11-2	G. A. Bennett.
“ “ 35.....	14	4	2	“ 13	17 09-0	“
At NE. cor. sec. 32.....	13	5	2	Dec. 7	17 44-5	“
“ “ 9.....	14	5	2	“ 3	17 49-1	“
“ “ 8.....	15	5	2	Nov. 30	17 56-2	“
30-00 W.—NE. cor. sec. 19.....	26	6	2	“ 22	18 13-6	“
36-00 S.—“ 29.....	40	8	2	May 24	20 18-3	P. R. A. Belanger.
At NE. cor. sec. 31.....	39	9	2	June 6	19 41-7	“
10-00 N.—NE. cor. sec. 19.....	40	9	2	“ 2	20 05-7	“
At SE. cor. sec. 5.....	41	9	2	May 29	20 15-0	“
38-00 N.—SE. cor. sec. 32.....	45	9	2	Aug. 19	20 34-4	W. J. Deans.
3-00 E.—NE. cor. sec. 31.....	56	9	2	Jan. 11	19 18-5	E. W. Robinson.
20-00 W.—“ 18.....	45	10	2	Oct. 24	20 26-6	G. A. Bennett.
10-00 E.—“ 13.....	45	10	2	“ 24	20 20-9	“
40-00 W.—“ 18.....	45	10	2	“ 24	20 27-3	“
20-00 W.—“ 36.....	45	10	2	Aug. 17	20 20-6	W. J. Deans.
At NE. cor. sec. 36.....	45	10	2	“ 18	19 50-7	“
10-00 W.—NE. cor. sec. 36.....	56	10	2	Jan. 12	18 58-1	E. W. Robinson
24-00 W.—“ 33.....	56	10	2	“ 15	18 21-1	“
At NE. cor. sec. 13.....	45	11	2	Oct. 24	20 07-7	G. A. Bennett.
65-00 W.—NE. cor. sec. 34.....	56	11	2	Jan. 18	18 27-8	E. W. Robinson.
16-50 W.—“ 31.....	56	11	2	“ 20	20 23-0	“
55-00 W.—“ 35.....	56	12	2	“ 22	21 46-1	“
73-00 W.—“ 34.....	56	12	2	“ 23	21 59-6	“
20-00 W.—“ 31.....	56	12	2	“ 25	21 11-5	“
5-00 W.—“ 33.....	56	13	2	“ 27	21 03-2	“
3-00 W.—“ 32.....	56	13	2	“ 30	21 39-0	“
68-00 S.—“ 31.....	6	14	2	June 23	17 22-3	G. A. Bennett.
“ “ 31.....	6	14	2	“ 23	17 18-0	“
“ “ 31.....	6	14	2	“ 23	17 17-4	“
At NE. cor. sec. 11.....	27A	14	2	July 22	19 33-6	F. V. Seibert.
“ “ 11.....	27A	14	2	“ 20	19 27-8	“
“ “ 11.....	27A	14	2	“ 23	19 26-5	“
“ “ 11.....	27A	14	2	“ 25	19 30-8	“
56-00 W.—NE. cor. sec. 35.....	56	14	2	Feb. 1	21 50-1	E. W. Robinson.
50-00 W.—“ 32.....	56	14	2	“ 3	21 27-5	“
5-00 W.—“ 33.....	56	15	2	“ 6	21 42-3	“



## SESSIONAL PAPER No. 25b

## MAGNETIC DECLINATION.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	Declination.	Observer.
41-00 N.—NE. cor. sec. 35.....	4	16	2	Aug. 17	18 03.5	G. A. Bennett.
" " " 35.....	4	16	2	" 17	18 00.4	"
40-00 N.—" " 35.....	4	16	2	" 17	18 16.4	"
51-00 E.—" " 32.....	56	16	2	Feb. 12	21 48.4	E. W. Robinson.
38-00 W.—" " 34.....	56	17	2	" 16	21 43.7	"
75-00 W.—" " 33.....	56	17	2	" 17	21 41.9	"
46-00 W.—" " 31.....	56	17	2	" 19	22 51.2	"
At NE. cor. sec. 31.....	52	18	2	Nov. 4	20 36.0	P. R. A. Belanger.
At SE. cor. sec. 6.....	53	18	2	" 5	20 37.4	"
17-58 W.—NE. cor. sec. 34.....	56	18	2	Feb. 22	23 28.0	E. W. Robinson.
" " " 34.....	56	18	2	" 23	23 24.5	"
65-00 W.—" " 33.....	56	18	2	" 23	23 19.3	"
65-00 W.—" " 33.....	56	18	2	" 24	23 15.7	"
15-00 S.—" " 36.....	27	19	2	Sept. 7	19 09.1	B. H. Segre.
18-00 S.—" " 1.....	33	19	2	Nov. 22	20 10.8	C. Rinfret.
40-00 S.—NW. " 30.....	46	19	2	July 22	21 44.7	R. C. Purser.
64-00 W.—NE. " 35.....	56	19	2	Feb. 26	23 35.4	E. W. Robinson.
75-43 W.—" " 31.....	56	19	2	" 28	23 01.1	"
At SW. cor. frac. sec. 36A.....	46	20	2	Sept. 26	21 58.4	R. C. Purser.
At NE. cor. sec. 32.....	52	20	2	Nov. 1	22 07.2	P. R. A. Belanger.
At SE. cor. sec. 5.....	53	20	2	" 1	22 06.9	"
75-00 W.—NE. cor. sec. 35.....	56	20	2	Feb. 29	23 23.6	E. W. Robinson.
10-00 W.—" " 33.....	56	20	2	Mar. 1	23 14.5	"
27-00 W.—" " 32.....	56	20	2	" 2	23 20.4	"
48-00 W.—" " 31.....	56	20	2	" 4	23 15.4	"
10-00 S.—" " 16.....	13	24	2	June 24	19 06.6	C. Rinfret.
10-00 N.—" " 7.....	14	24	2	" 18	19 26.1	"
At NE. cor. sec. 31.....	15	25	2	Nov. 26	19 19.3	G. A. Bennett.
" " 21.....	24	25	2	July 15	20 09.9	F. V. Seibert.
40-00 S.—NE. cor. sec. 20.....	26	25	2	" 16	19 39.8	"
40-50 E.—" " 34.....	15	26	2	Nov. 25	19 16.1	G. A. Bennett.
" " " 34.....	15	26	2	" 25	19 17.1	"
10-00 W.—SE. " 6.....	31	26	2	Oct. 9	21 33.8	B. H. Segre.
40-00 S.—NE. " 2.....	24	27	2	Nov. 5	20 33.5	"
At SE. cor. sec. 2.....	43	28	2	Sept. 21	21 13.6	R. C. Purser.
41-84 N.—NE. cor. sec. 36.....	13	29	2	July 13	19 27.9	C. Rinfret.
At NW. cor. sec. 19.....	14	29	2	" 23	19 48.6	"
15-00 S.—NE. cor. sec. 34.....	14	29	2	Aug. 9	19 58.1	"
1-00 S.—" " 20.....	14	29	2	" 10	19 38.5	"
20-00 N.—" " 25.....	7	1	3	July 2	19 28.9	F. V. Seibert.
5-00 S.—" " 17.....	14	1	3	" 17	20 01.6	C. Rinfret.
5-00 S.—" " 10.....	14	1	3	Oct. 25	20 32.8	"
At SE. cor. sec. 5.....	39	1	3	June 10	22 17.5	R. C. Purser.
20-00 E.—NE. cor. sec. 11.....	54	1	3	Sept. 24	23 27.3	P. R. A. Belanger.
At NE. cor. sec. 9.....	55	1	3	Oct. 2	23 40.4	"
" " 7.....	56	1	3	Sept. 25	22 52.1	"
30-00 S.—NE. cor. sec. 13.....	57	1	3	July 24	23 11.9	J. A. Fletcher.
" " 13.....	57	1	3	" 24	23 12.6	"
" " 13.....	57	1	3	" 25	23 12.9	"
" " 13.....	57	1	3	" 25	23 13.5	"
" " 13.....	57	1	3	" 27	23 12.3	"
" " 13.....	57	1	3	" 27	23 13.5	"
78-00 N.—" " 36.....	64	1	3	April 14	23 44.0	A. Saint-Cyr.
70-00 N.—" " 25.....	65	1	3	" 19	24 23.7	"
14-00 N.—" " 36.....	65	1	3	" 22	24 09.1	"
23-00 N.—" " 25.....	66	1	3	May 2	23 54.3	"
33-00 N.—" " 36.....	66	1	3	" 6	23 44.8	"
39-00 N.—" " 2.....	67	1	3	" 10	23 45.6	"
22-00 N.—" " 24.....	67	1	3	" 14	23 45.2	"
24-00 N.—" " 12.....	68	1	3	" 23	23 28.2	"
76-00 W.—" " 32.....	68	1	3	June 4	23 24.3	"
37-00 N.—" " 28.....	13	2	3	Aug. 2	20 36.2	C. Rinfret.
29-00 S.—" " 3.....	14	2	3	July 29	20 33.0	"
13-00 W.—" " 36.....	68	2	3	June 5	23 56.7	A. Saint-Cyr.
47-00 W.—" " 35.....	68	2	3	" 11	21 59.5	"
63-00 W.—" " 35.....	68	2	3	" 12	22 11.4	"
33-00 W.—" " 33.....	68	2	3	" 13	22 20.0	"
30-00 S.—" " 21.....	25	3	3	Oct. 23	21 01.0	B. H. Segre.
20-00 N.—" " 25.....	34	3	3	May 22	22 43.6	R. C. Purser.
48-00 W.—" " 36.....	68	3	3	June 17	21 12.8	A. Saint-Cyr.
60-00 W.—" " 33.....	68	3	3	" 20	24 06.6	"



4 GEORGE V., A. 1914

## MAGNETIC DECLINATION.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	Declination.	Observer.
64-00 W.—NE. cor. sec. 32.....	68	3	3	June 22	25 09.3	A. Saint Cyr.
10-00 W.—“ 36.....	68	4	3	“ 24	26 02.0	“
54-00 W.—“ 33.....	68	4	3	“ 28	23 44.6	“
At NE. cor. sec. 19.....	49	5	3	Oct. 8	20 37.2	R. C. Purser.
65-00 S.—NE. cor. sec. 6.....	49	5	3	“ 9	20 46.4	“
30-00 E.—“ 7.....	49	5	3	“ 4	20 53.7	“
2-50 W.—“ 36.....	68	5	3	July 5	22 51.7	A. Saint-Cyr.
50-00 W.—“ 36.....	68	5	3	“ 8	24 34.9	“
54-00 W.—“ 33.....	68	5	3	“ 12	23 51.0	“
53-00 W.—“ 32.....	68	5	3	“ 15	23 28.6	“
60-00 W.—“ 31.....	68	5	3	“ 16	23 07.8	“
At $\frac{1}{2}$ post N. by sec. 24.....	33	6	3	Aug. 29	22 56.1	R. C. Purser.
3-40 S.—NE. cor. sec. 18.....	49	6	3	Oct. 14	21 54.9	“
65-10 W.—SW. “ 16.....	49	6	3	“ 15	21 17.3	“
13-81 W.—NE. cor. sec. 18.....	49	6	3	Nov. 28	21 31.6	R. C. Purser.
10-00 S.—NW. “ 20.....	56	6	3	Oct. 15	22 26.9	P.R.A. Belanger.
74-00 W.—NE. “ 36.....	68	6	3	July 20	23 53.2	A. Saint-Cyr.
60-00 W.—“ 35.....	68	6	3	“ 22	25 19.4	“
48-00 W.—“ 34.....	68	6	3	“ 23	24 43.5	“
60-00 W.—“ 34.....	68	6	3	“ 24	24 42.2	“
18-00 W.—“ 32.....	68	6	3	“ 25	23 25.3	“
46-00 W.—“ 31.....	68	6	3	“ 26	25 22.2	“
At NE. cor. sec. 6.....	26	7	3	May 24	21 40.1	F. V. Seibert.
“ “ 6.....	26	7	3	“ 25	21 32.5	“
3-70 S.—NE. cor. sec. 36.....	49	7	3	Oct. 16	22 21.3	R. C. Purser.
32-00 E.—“ 24.....	49	7	3	Nov. 26	21 29.6	“
37-00 E.—“ 24.....	49	7	3	“ 26	21 25.6	“
37-00 E.—“ 24.....	49	7	3	“ 27	21 32.5	“
10-00 W.—“ 24.....	56	7	3	Oct. 13	22 41.4	P.R.A. Belanger.
40-00 W.—“ 12.....	57	7	3	“ 8	22 45.2	“
56-00 W.—“ 34.....	68	7	3	July 29	25 09.4	A. Saint-Cyr.
17-00 W.—“ 32.....	68	7	3	“ 30	24 33.8	“
5-00 E.—“ 22.....	53	8	3	June 17	21 43.0	W. J. Deans.
At NE. cor. sec. 21.....	54	8	3	“ 14	22 25.7	“
8-00 W.—SE. cor. sec. 4.....	55	8	3	“ 15	21 32.0	“
13-00 W.—NE. cor. sec. 36.....	68	8	3	Aug. 1	24 47.2	A. Saint-Cyr.
74-00 W.—“ 36.....	68	8	3	“ 2	25 28.6	“
73-00 W.—“ 35.....	68	8	3	“ 3	25 34.4	“
32-00 W.—“ 33.....	68	8	3	“ 5	24 48.8	“
56-00 W.—“ 32.....	68	8	3	“ 6	24 22.5	“
67-00 W.—“ 36.....	68	9	3	“ 8	25 05.1	“
25-00 W.—“ 34.....	68	9	3	“ 14	25 58.3	“
28-00 W.—“ 33.....	68	9	3	“ 15	25 57.3	“
42-00 W.—“ 32.....	68	9	3	“ 16	26 08.6	“
38-50 W.—“ 31.....	68	9	3	“ 17	26 00.9	“
At NE. cor. sec. 31.....	16	10	3	Oct. 1	21 26.6	F. V. Seibert.
50-00 E.—NE. cor. sec. 31.....	31	10	3	May 28	21 57.8	R. C. Purser.
At NE. cor. sec. 32.....	32	10	3	June 3	21 52.8	“
46-00 W.—NE. cor. sec. 36.....	68	10	3	Aug. 19	26 56.6	A. Saint-Cyr.
47-00 W.—“ 32.....	68	10	3	“ 21	27 45.7	“
At NE. cor. sec. 36.....	16	11	3	Sept. 28	21 34.0	F. V. Seibert.
“ “ 36.....	16	11	3	Oct. 7	21 22.7	“
40-00 S.—NE. cor. sec. 2.....	17	11	3	“ 4	20 59.5	“
At NE. cor. sec. 1.....	17	11	3	“ 6	21 24.4	“
“ “ 2.....	17	11	3	“ 3	21 10.7	“
40-00 S.—NE. cor. sec. 2.....	17	11	3	May 31	21 25.0	“
40-00 S.—“ 2.....	17	11	3	June 21	21 19.7	“
3-00 W.—“ 36.....	68	11	3	Aug. 22	27 48.4	A. Saint-Cyr.
49-00 W.—“ 35.....	68	11	3	“ 27	27 57.2	“
55-00 W.—“ 32.....	68	11	3	“ 30	26 54.4	“
67-00 W.—“ 34.....	68	11	3	“ 31	26 35.3	“
20-00 W.—“ 31.....	50	12	3	July 4	23 53.1	W. J. Deans.
70-00 W.—“ 31.....	50	12	3	“ 5	24 19.4	“
20-00 W.—SE. “ 6.....	51	12	3	June 29	24 36.8	“
At NE. cor. sec. 6.....	51	12	3	July 9	23 56.1	“
56-57 W.—NE. cor. sec. 18.....	61	12	3	Aug. 14	26 00.3	C. F. Miles.
55-44 W.—“ 18.....	61	12	3	“ 14	26 04.1	“
6-00 W.—“ 35.....	68	12	3	Sept. 2	26 26.1	A. Saint-Cyr.
44-00 W.—“ 34.....	68	12	3	“ 3	26 29.8	“
26-00 W.—“ 33.....	68	12	3	“ 4	27 19.8	“
8-00 W.—“ 31.....	68	12	3	“ 9	22 44.4	“



## SESSIONAL PAPER No. 25b

## MAGNETIC DECLINATION.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	Declination.	Observer.
60-00 S.—NE. cor. sec. 15.....	16	13	3	June 9	21 44-2	F. V. Seibert.
20-00 S.—“ 15.....	16	13	3	“ 11	21 51-4	“
20-00 S.—“ 15.....	16	13	3	“ 13	21 44-4	“
At NE. cor. sec. 26.....	26	13	3	Sept. 24	21 09-2	“
“ “ 25.....	26	13	3	“ 24	21 06-6	“
80-00 W.—NE. cor. sec. 36.....	68	13	3	“ 10	26 40-8	A. Saint-Cyr.
7-00 W.—“ 34.....	68	13	3	“ 11	26 26-3	“
14-00 W.—“ 31.....	68	13	3	“ 23	26 22-9	“
1-25 S.—“ 8.....	13	14	3	July 16	20 43-9	S. L. Evans.
At NE. cor. sec. 9.....	13	14	3	“ 17	20 58-3	“
22-00 W.—NE. cor. sec. 35.....	68	14	3	Sept. 25	25 39-2	A. Saint-Cyr.
57-00 W.—“ 34.....	68	14	3	“ 26	25 47-8	“
67-00 W.—“ 33.....	68	14	3	“ 28	25 50-3	“
40-00 N.—“ 32.....	68	14	3	“ 29	25 42-4	“
40-00 N.—“ 32.....	68	14	3	“ 29	25 43-6	“
At NE. cor. sec. 27.....	19	15	3	Aug. 4	22 21-3	F. V. Seibert.
26-70 W.—NE. cor. sec. 3.....	48	15	3	July 2	24 41-7	R. C. Purser.
40-00 N.—“ 11.....	47	16	3	June 25	23 53-2	“
At NE. cor. sec. 11.....	47	16	3	“ 26	24 14-6	“
“ “ 22.....	18	17	3	“ 17	21 30-6	F. V. Seibert.
40-00 S.—NE. cor. sec. 21.....	17	18	3	“ 7	21 07-4	“
At $\frac{1}{2}$ post—N. by sec. 20.....	36	19	3	Sept. 16	23 14-7	R. C. Purser.
At SW. cor. sec. 6.....	47	19	3	“ 25	21 59-7	“
0-98 W.—NE. cor. sec. 19.....	8	22	3	June 4	21 49-1	S. L. Evans.
0-53 S.—“ 21.....	8	22	3	“ 7	21 43-6	“
0-23 S.—“ 22.....	8	22	3	“ 7	21 37-0	“
7-00 W.—“ 20.....	8	22	3	“ 8	21 44-6	“
0-16 S.—“ 24.....	8	22	3	“ 10	21 41-9	“
0-21 N.—“ 23.....	8	22	3	“ 10	21 39-0	“
0-23 S.—“ 8.....	8	22	3	“ 12	21 40-5	“
0-10 W.—“ 7.....	8	22	3	“ 18	21 40-9	“
5-00 W.—“ 9.....	8	22	3	“ 19	21 40-0	“
0-34 S.—“ 10.....	8	22	3	“ 19	21 39-5	“
0-30 S.—“ 11.....	8	22	3	“ 20	21 38-9	“
At $\frac{1}{2}$ post—E. by sec. 33.....	53	22	3	“ 19	24 37-8	R. C. Purser.
40-00 E.—NE. cor. sec. 7.....	14	23	3	Sept. 27	22 06-8	C. Rinfret.
35-00 N.—“ 11.....	15	23	3	“ 24	22 14-9	“
0-35 W.—“ 11.....	6	24	3	June 25	20 37-5	S. L. Evans.
8-00 W.—“ 10.....	6	24	3	“ 25	20 16-1	“
50-00 W.—“ 9.....	6	24	3	“ 25	19 58-0	“
7-00 W.—“ 22.....	6	24	3	July 2	20 46-5	“
0-50 S.—“ 9.....	6	24	3	“ 6	19 53-5	“
23-00 W.—“ 8.....	6	24	3	Aug. 12	20 07-0	“
2-03 S.—“ 7.....	6	24	3	“ 12	20 24-1	“
20-00 W.—“ 22.....	15	24	3	Sept. 14	22 01-0	C. Rinfret.
10-00 W.—“ 11.....	6	25	3	Aug. 6	21 44-2	S. L. Evans.
0-50 W.—“ 10.....	6	25	3	“ 6	22 22-3	“
1-00 S.—“ 9.....	6	25	3	“ 8	23 16-9	“
8-00 N.—“ 20.....	6	25	3	“ 9	23 08-0	“
0-50 S.—“ 7.....	6	25	3	“ 26	23 07-2	“
0-50 E.—“ 8.....	6	25	3	“ 26	23 15-7	“
0-60 W.—“ 21.....	6	25	3	“ 26	23 21-7	“
20-00 E.—“ 36.....	13	25	3	“ 27	22 33-1	C. Rinfret.
50-00 S.—“ 30.....	53	25	3	“ 7	24 22-7	G. J. Lonergan.
0-25 E.—“ 32.....	5	26	3	“ 21	22 27-2	S. L. Evans.
2-00 E.—“ 9.....	6	26	3	“ 15	22 18-8	“
“ “ 9.....	6	26	3	“ 15	22 20-5	“
0-15 W.—“ 33.....	6	26	3	“ 21	22 39-2	“
0-30 W.—“ 21.....	6	26	3	“ 24	22 16-9	“
9-50 S.—“ 22.....	6	26	3	“ 29	22 24-1	“
15-00 N.—“ 14.....	6	26	3	“ 30	22 33-9	“
At NE. cor. sec. 33.....	37	26	3	“ 19	22 36-5	R. C. Purser.
57-00 S.—NE. cor. sec. 14.....	6	27	3	Sept. 4	21 52-4	S. L. Evans.
0-60 W.—“ 8.....	7	28	3	“ 11	21 50-5	“
5-00 E.—“ 7.....	7	28	3	“ 9	21 57-0	“
0-25 E.—“ 9.....	7	28	3	“ 11	21 49-0	“
0-60 E.—“ 11.....	7	28	3	“ 2	21 42-0	“
0-40 N.—“ 10.....	7	28	3	“ 12	21 44-4	“
25-00 S.—54° 34' E. of $\frac{1}{2}$ post on E. by sec. 21.....	6	1	4	June 16	21 48-4	E. S. Martindale.
152-50 E.—NE. cor. sec. 1.....	63	1	4	July 3	25 58-0	C. F. Miles.
48-18 N.—“ 13.....	106	1	4	Sept. 26	30 38-1	J. B. McFarlane.



4 GEORGE V., A. 1914

## MAGNETIC DECLINATION.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	Declination.	Observer.
55-95 N.—NE. cor. sec. 36.....	108	1	4	July 18	30 27-8	J. B. McFarlane.
16-72 N.—“ 1.....	109	1	4	“ 19	30 37-8	“
58-02 N.—“ 1.....	109	1	4	“ 20	30 35-4	“
67-41 N.—“ 25.....	109	1	4	“ 24	30 34-6	“
5-02 N.—“ 36.....	110	1	4	Aug. 6	30 30-6	“
61-74 N.—“ 25.....	111	1	4	“ 12	30 22-2	“
4-00 N.—“ 25.....	112	1	4	“ 21	32 21-8	“
27-25 N.—“ 24.....	113	1	4	“ 27	32 22-9	“
67-59 N.—“ 36.....	114	1	4	Sept. 7	32 50-7	“
11-04 N.—“ 1.....	115	1	4	“ 11	32 57-5	“
11-04 N.—“ 1.....	115	1	4	“ 13	32 58-2	“
At NE. cor. sec. 16.....	6	2	4	June 1	21 47-6	E. S. Martindale
Centre sec. 24.....	8	3	4	Aug. 15	22 09-1	F. V. Seibert.
“ 24.....	8	3	4	“ 16	22 06-9	“
“ 24.....	8	3	4	“ 17	22 04-5	“
15-00 S.—NE. cor. sec. 10.....	17	3	4	July 18	23 08-7	G. C. Cowper.
20-00 E.—“ 10.....	17	3	4	“ 23	23 10-9	“
20-00 E.—“ 10.....	17	3	4	“ 28	23 12-9	“
10-00 E.—“ 33.....	18	3	4	Aug. 4	23 16-5	“
5-00 N.—“ 20.....	18	3	4	“ 8	23 17-5	“
10-00 W.—“ 20.....	18	3	4	“ 19	23 16-9	“
10-00 E.—“ 33.....	18	3	4	“ 24	23 20-5	“
15-00 W.—“ 11.....	19	3	4	July 7	23 20-9	“
At NE. cor. sec. 10.....	19	3	4	“ 7	23 11-7	“
20-00 N.—NE. cor. sec. 16.....	17	4	4	Sept. 1	23 18-8	“
1-00 E.—“ 33.....	19	4	4	June 5	23 10-3	“
10-00 S.—“ 33.....	19	4	4	“ 10	23 13-6	“
42-36 W.—“ 31.....	92	5	4	Oct. 26	29 49-0	J. B. McFarlane.
69-10 W.—“ 32.....	92	5	4	“ 27	30 16-2	“
10-00 W.—“ 36.....	1	6	4	June 2	21 54-5	C. M. Walker.
At NE. cor. sec. 8.....	1	6	4	“ 16	22 06-5	“
“ 3.....	1	6	4	“ 23	22 16-7	“
60-00 S.—NE. cor. sec. 1.....	1	6	4	“ 26	22 15-3	“
25-00 N.—“ 25.....	2	6	4	May 24	22 00-7	“
5-00 S.—“ 23.....	2	6	4	“ 28	22 08-3	“
18-00 N.—“ 8.....	2	6	4	“ 29	22 06-7	“
At NE. cor. sec. 33.....	2	6	4	“ 24	22 22-8	“
59-93 W.—NE. cor. sec. 35.....	72	7	4	April 6	27 26-4	G. H. Blanchet.
78-22 W.—“ 32.....	72	8	4	“ 14	29 01-6	“
30-23 W.—“ 33.....	72	9	4	“ 20	27 33-7	“
31-34 N.—“ 11.....	22	10	4	Sept. 22	23 35-5	G. C. Cowper.
“ 11.....	22	10	4	“ 23	23 33-8	“
5-20 W.—“ 31.....	72	10	4	April 29	27 59-4	G. H. Blanchet.
32-43 W.—“ 36.....	76	10	4	May 29	30 14-5	G. McMillan.
At NE. cor. sec. 11.....	38	11	4	Aug. 30	25 08-7	F. V. Seibert.
40-00 S.—NE. cor. sec. 11.....	38	11	4	Sept. 2	24 59-8	“
16-01 W.—“ 31.....	72	11	4	May 2	28 19-4	G. H. Blanchet.
25-99 W.—“ 32.....	76	11	4	June 6	30 36-0	G. McMillan.
At NE. cor. sec. 13.....	24	12	4	Sept. 11	24 28-8	F. V. Seibert.
23-86 W.—NE. cor. sec. 34.....	72	12	4	May 7	28 02-5	G. H. Blanchet.
77-06 W.—“ 36.....	72	13	4	“ 9	28 24-2	“
64-17 W.—“ 36.....	76	13	4	June 16	30 48-9	G. McMillan.
54-35 W.—“ 31.....	76	13	4	“ 23	30 18-5	“
At NE. cor. sec. 35.....	26	14	4	Sept. 10	23 53-2	F. V. Seibert.
3-00 E.—NE. cor. sec. 35.....	26	14	4	“ 11	23 59-8	“
31-06 W.—“ 36.....	72	14	4	May 14	28 37-6	G. H. Blanchet.
45-73 W.—“ 36.....	76	14	4	June 21	30 06-6	G. McMillan.
At SE. cor. sec. 2.....	27	15	4	Sept. 10	24 19-1	F. V. Seibert.
7-10 W.—NE. cor. sec. 34.....	72	15	4	May 22	29 05-3	G. H. Blanchet.
46-78 W.—“ 33.....	76	15	4	July 8	28 11-8	G. McMillan.
7-60 W.—“ 32.....	72	16	4	June 1	28 33-5	G. H. Blanchet.
36-68 W.—“ 31.....	76	16	4	July 20	29 34-4	G. McMillan.
28-00 N.—“ 8.....	5	17	4	June 1	22 57-6	P. B. Street.
23-00 N.—“ 10.....	5	17	4	“ 6	23 00-2	“
71-33 W.—“ 35.....	72	17	4	“ 5	28 45-9	G. H. Blanchet.
38-95 W.—“ 33.....	76	17	4	July 29	29 44-0	G. McMillan.
48-99 W.—“ 33.....	88	17	4	Jan. 3	30 53-3	G. H. Blanchet.
2-00 N.—“ 23.....	5	18	4	June 12	23 04-2	P. B. Street.
10-44 W. 19-60 S.—NE. cor. sec. 33.....	72	18	4	“ 12	28 50-6	G. H. Blanchet.
48-69 W.—NE. cor. sec. 31.....	72	18	4	“ 17	28 56-3	“
71-44 W.—“ 36.....	76	18	4	Aug. 1	29 26-7	G. McMillan.



## SESSIONAL PAPER No. 25b

## MAGNETIC DECLINATION.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	Declination.	Observer.
38-88 W.—NE. cor. sec. 31.....	76	18	4	Aug. 13	29 12-8	G. Mc Millan
11-49 W.—“ 32.....	88	18	4	Jan. 15	30 44-9	G. H. Blanchet.
20-00 S.—“ 24.....	2	19	4	June 20	22 21-2	P. B. Street.
“ W.—“ 36.....	72	19	4	“ 18	29 02-2	G. H. Blanchet.
60-30 W.—“ 32.....	72	19	4	“ 23	29 10-5	“
68-29 W.—“ 35.....	76	19	4	Aug. 17	28 56-5	G. McMillan.
52-89 W.—“ 31.....	88	19	4	Jan. 25	30 42-4	G. H. Blanchet.
14-30 W.—“ 32.....	72	20	4	June 29	28 45-9	“
55-20 W.—“ 32.....	76	20	4	Sept. 6	28 41-3	G. McMillan.
52-41 W.—“ 32.....	88	20	4	Jan. 31	30 19-4	G. H. Blanchet.
13-78 W.—“ 36.....	72	21	4	July 2	28 34-8	“
1-22 W.—“ 32.....	76	21	4	Sept. 11	29 06-7	G. McMillan.
0-86 W.—“ 31.....	88	21	4	Feb. 7	27 50-3	G. H. Blanchet.
At NE. cor. sec. 6.....	49	22	4	Oct. 17	26 44-2	F. V. Seibert.
“ “ 6.....	49	22	4	“ 24	26 28-1	“
78-14 W.—NE. cor. sec. 36.....	76	22	4	Sept. 17	29 09-5	G. McMillan.
55-64 W.—“ 32.....	76	22	4	“ 24	28 36-8	“
22-00 W.—“ 34.....	88	22	4	Feb. 9	27 24-4	G. H. Blanchet.
78-00 W.—“ 32.....	72	23	4	July 18	28 36-2	“
26-35 W.—“ 33.....	76	23	4	Sept. 30	28 50-4	G. McMillan.
1-00 W.—“ 35.....	88	23	4	Feb. 13	29 53-3	G. H. Blanchet.
71-10 W.—“ 35.....	72	24	4	July 20	29 09-8	“
64-42 W.—“ 32.....	76	24	4	Oct. 9	29 36-0	G. McMillan.
65-00 W.—“ 34.....	88	24	4	Feb. 20	30 30-2	G. H. Blanchet.
17-05 W.—“ 33.....	72	25	4	July 29	29 05-2	“
19-04 W.—“ 32.....	76	25	4	Oct. 16	29 01-7	G. McMillan.
At NE. cor. sec. 34.....	88	25	4	Mar. 4	30 19-4	G. H. Blanchet.
18-60 W.—NE. cor. sec. 34.....	72	26	4	Aug. 6	28 46-2	“
18-00 W.—“ 34.....	76	26	4	Oct. 26	29 12-1	G. McMillan.
30-00 N.—“ 27.....	50	28	4	Nov. 12	27 16-3	R. C. Purser.
NE. Bk. 7—Villa lots, SW. $\frac{1}{4}$ sec. 26.....	1	30	4	Sept. 16	21 50-4	F. V. Seibert.
16-76 S.—NE. cor. sec. 13.....	24	1	5	“ 11	25 22-4	J. A. Fletcher.
“ “ 13.....	24	1	5	“ 12	25 22-8	“
At NE. cor. sec. 25.....	50	1	5	Aug. 13	27 02-8	R. C. Purser.
60-75 W.—NE. cor. sec. 35.....	88	1	5	April 10	31 07-4	A. H. Hawkins.
At NE. cor. sec. 31.....	88	1	5	“ 15	30 35-0	“
38-00 N.—NE. cor. sec. 35.....	11	2	5	Nov. 4	24 11-1	P. B. Street.
2-00 N.—“ 28.....	11	2	5	“ 20	24 09-2	“
8-00 S.—“ 21.....	12	2	5	Dec. 4	24 13-8	“
28-00 S.—“ 34.....	12	2	5	“ 12	24 05-8	“
44-64 W.—“ 36.....	88	2	5	April 16	30 49-0	A. H. Hawkins.
52-06 W.—“ 31.....	88	2	5	“ 17	31 11-5	“
44-00 W.—“ 33.....	88	2	5	“ 18	30 17-3	“
44-00 W.—“ 33.....	88	2	5	“ 19	30 12-2	“
51-00 E.—“ 19.....	10	3	5	Oct. 10	24 00-9	P. B. Street.
10-00 E.—“ 10.....	11	3	5	“ 21	23 53-8	“
42-00 S.—“ 9.....	12	3	5	July 26	24 01-2	“
In SE. $\frac{1}{4}$ sec. 6.....	12	3	5	“ 28	23 49-9	“
53-88 W.—NE. cor. sec. 34.....	88	3	5	April 23	29 48-0	A. H. Hawkins.
40-82 W.—“ 33.....	88	3	5	“ 25	31 00-4	“
7-89 W.—“ 31.....	88	3	5	“ 27	30 51-3	“
25-00 N.—“ 7.....	11	4	5	Sept. 27	23 36-9	P. B. Street.
68-00 S.—“ 20.....	19	4	5	Nov. 5	24 56-2	S. L. Evans.
60-00 W.—“ 32.....	63	4	5	Oct. 5	29 02-5	G. J. Lonergan.
37-71 W.—“ 35.....	88	4	5	April 30	32 00-8	A. H. Hawkins.
26-00 W.—“ 34.....	88	4	5	May 1	31 09-4	“
7-01 W.—“ 32.....	88	4	5	“ 3	29 56-6	“
43-00 S.—“ 11.....	12	5	5	Aug. 25	24 06-9	P. B. Street.
37-00 N.—“ 2.....	13	5	5	“ 12	24 04-5	“
12-00 S.—“ 25.....	19	5	5	Oct. 13	25 01-8	S. L. Evans.
43-00 N.—“ 12.....	19	5	5	Nov. 15	25 07-6	“
56-78 S.—“ 36.....	20	5	5	Oct. 2	25 05-6	“
60-00 E.—“ 22.....	64	5	5	“ 3	28 30-0	G. J. Lonergan.
11-00 W.—“ 36.....	88	5	5	May 4	31 26-2	A. H. Hawkins.
11-94 W.—“ 33.....	88	5	5	“ 6	30 31-8	“
10-88 W.—“ 32.....	88	5	5	“ 7	31 32-1	“
72-61 W.—“ 31.....	88	5	5	“ 9	31 44-2	“
5-00 W.—“ 36.....	16	6	5	Nov. 18	25 03-5	E. S. Martindale.
20-00 N.—“ 24.....	20	6	5	Oct. 14	25 15-4	S. L. Evans.
20-00 N.—“ 24.....	20	6	5	“ 14	25 05-4	“
40-00 S.—“ 34.....	42	6	5	“ 30	27 07-7	G. J. Lonergan.



## MAGNETIC DECLINATION.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	Declination.	Observer.
12-83 W.—NE. cor. sec. 33.....	88	6	5	May 13	32 51.5	A. H. Hawkins.
74-03 W.—“ 33.....	88	6	5	“ 14	31 56.9	“
43-89 W.—“ 31.....	88	6	5	“ 15	31 14.3	“
15-00 S.—“ 34.....	41	7	5	Nov. 4	26 57.6	G. J. Lonergan.
At NE. cor. sec. 35.....	41	7	5	“ 4	26 56.4	“
5-00 W.—NE. cor. sec. 34.....	41	7	5	“ 4	26 57.3	“
1-76 W.—NE. cor. sec. 34.....	88	7	5	May 21	30 39.0	A. H. Hawkins.
“ 34.....	88	7	5	“ 22	30 29.8	“
57-28 W.—“ 33.....	88	7	5	“ 23	30 30.0	“
22-76 W.—“ 36.....	88	8	5	“ 28	29 59.9	“
0-91 W.—“ 34.....	88	8	5	“ 29	29 18.6	“
0-91 W.—“ 34.....	88	8	5	“ 30	29 10.8	“
79-56 W.—“ 33.....	88	8	5	“ 31	29 06.9	“
32-47 W.—“ 36.....	88	9	5	June 3	28 33.5	“
0-43 W.—“ 33.....	88	9	5	“ 5	30 16.3	“
40-57 W.—“ 33.....	88	9	5	“ 7	29 49.5	“
68-85 W.—“ 31.....	88	9	5	“ 15	29 44.3	“
40-72 W.—“ 36.....	88	10	5	“ 17	29 41.0	“
14-71 W.—“ 35.....	88	10	5	“ 18	29 44.2	“
23-96 W.—“ 34.....	88	10	5	“ 19	29 42.6	“
0-80 W.—“ 33.....	88	10	5	“ 20	29 39.4	“
28-20 W.—“ 36.....	88	11	5	“ 24	28 50.8	“
17-88 W.—“ 35.....	88	11	5	“ 25	28 35.4	“
40-52 W.—“ 32.....	88	11	5	“ 29	29 38.7	“
12-60 N.—“ 36.....	88	12	5	Jan. 5	28 41.1	L. E. Fontaine.
16-34 W.—“ 36.....	88	12	5	July 1	29 23.8	A. H. Hawkins.
5-48 W.—“ 35.....	88	12	5	“ 3	28 55.9	“
39-68 W.—“ 34.....	88	12	5	“ 4	28 42.3	“
59-10 W.—“ 33.....	88	12	5	“ 5	28 34.2	“
71-94 W.—“ 36.....	88	13	5	“ 10	28 55.4	“
76-00 W.—“ 34.....	88	13	5	“ 11	28 58.5	“
4-28 W.—“ 33.....	88	13	5	“ 12	29 27.7	“
64-30 W.—“ 31.....	88	13	5	“ 15	28 50.0	“
7-88 N.—“ 35.....	48	14	5	Jan. 19	27 13.4	L. E. Fontaine.
37-32 W.—“ 36.....	88	14	5	July 16	28 59.3	A. H. Hawkins.
0-42 W.—“ 33.....	88	14	5	“ 22	30 04.5	“
42-50 W.—“ 32.....	88	14	5	“ 23	29 44.2	“
20-59 S.—“ 36.....	49	15	5	Jan. 24	27 39.0	L. E. Fontaine.
3-17 S.—“ 4.....	51	15	5	“ 31	27 43.1	“
18-62 W.—“ 36.....	88	15	5	July 24	30 56.4	A. H. Hawkins.
5-34 W.—“ 32.....	88	15	5	“ 27	31 04.0	“
At NE. cor. sec. 31.....	48	16	5	Dec. 7	27 35.7	H. Matheson.
38-00 S.—NE. cor. sec. 31.....	48	16	5	“ 13	27 28.5	“
20-00 W.—“ 19.....	48	16	5	“ 15	27 29.2	“
30-00 S.—“ 8.....	49	16	5	“ 5	27 35.3	“
36-00 S.—“ 4.....	49	16	5	“ 4	27 31.6	“
30-00 E.—“ 7.....	49	16	5	“ 6	27 40.1	“
4-00 N.—“ 6.....	49	16	5	“ 7	27 33.5	“
30-00 W.—“ 35.....	49	16	5	Oct. 15	27 46.1	“
At NE. cor. sec. 35.....	49	16	5	“ 16	27 55.0	“
45-00 S.—NE. cor. sec. 26.....	49	16	5	“ 30	27 55.0	“
42-50 E.—“ 23.....	49	16	5	“ 31	27 52.7	“
28-00 W.—“ 23.....	49	16	5	Nov. 1	27 54.7	“
At NE. cor. sec. 34.....	49	16	5	“ 2	27 49.3	“
14-00 N.—NE. cor. sec. 27.....	49	16	5	“ 2	27 52.9	“
38-00 N.—“ 22.....	49	16	5	“ 7	27 48.2	“
30-00 N.—“ 15.....	49	16	5	“ 13	27 45.1	“
35-00 N.—“ 10.....	49	16	5	“ 18	27 41.5	“
2-00 N.—“ 14.....	49	16	5	“ 20	27 44.6	“
At NE. cor. sec. 11.....	49	16	5	“ 20	27 37.0	“
27-00 E.—NE. cor. sec. 11.....	49	16	5	“ 21	27 36.2	“
38-00 E.—“ 10.....	49	16	5	“ 22	27 36.6	“
30-00 N.—“ 9.....	49	16	5	“ 26	27 39.7	“
36-00 N.—“ 16.....	49	16	5	“ 28	27 45.1	“
20-00 W.—“ 9.....	49	16	5	“ 29	27 39.6	“
30-00 S.—“ 2.....	50	16	5	Oct. 18	27 49.4	“
20-00 S.—“ 11.....	50	16	5	“ 21	27 50.2	“
38-00 E.—“ 11.....	50	16	5	“ 22	27 53.2	“
18-00 E.—“ 10.....	50	16	5	“ 28	27 42.9	“
48-29 W.—“ 35.....	88	16	5	Aug. 1	31 33.3	A. H. Hawkins.
At NE. cor. sec. 29.....	28	17	5	June 29	24 28.1	N. C. Stewart.



## SESSIONAL PAPER No. 25b

## MAGNETIC DECLINATION.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	Declination.	Observer.
30-00 S.—NE. cor. sec. 34	48	17	5	Dec. 26	27 34.8	H. Matheson.
6-00 N.—" 26	48	17	5	" 21	27 31.2	"
16-00 S.—" 1	49	17	5	" 10	27 34.2	"
9-00 N.—" 1	49	17	5	" 11	27 39.1	"
47-02 W.—" 36	88	17	5	Aug. 6	31 06.0	A. H. Hawkins.
5-70 W.—" 34	88	17	5	" 7	31 03.0	"
20-70 W.—" 31	88	17	5	" 10	31 06.7	"
16-05 S.—" 32	49	18	5	July 4	28 28.0	L. E. Fontaine.
62-50 W.—" 32	88	18	5	Aug. 19	25 21.6	A. H. Hawkins.
52-00 S.—" 36	50	19	5	July 9	28 03.4	L. E. Fontaine.
73-07 W.—" 35	88	19	5	Aug. 21	31 45.3	A. H. Hawkins.
42-96 W.—" 33	88	19	5	" 22	31 31.5	"
21-19 W.—" 31	88	19	5	" 23	31 23.7	"
0-85 N.—" 34	50	20	5	May 21	28 16.2	L. E. Fontaine.
8-10 S.—" 9	56	20	5	June 5	29 01.5	"
72-70 N.—" 7	83	20	5	Aug. 8	29 58.6	"
15-96 W.—" 35	88	20	5	" 26	31 03.2	A. H. Hawkins.
25-08 W.—" 31	88	20	5	Sept. 2	31 04.4	"
65-75 N.—" 22	49	21	5	May 3	28 04.1	L. E. Fontaine.
2-05 N.—" 12	50	21	5	" 8	28 04.7	"
6-65 S.—" 22	56	21	5	June 9	29 24.4	"
50-80 N.—" 36	81	21	5	Aug. 5	29 49.7	"
41-89 W.—" 35	88	21	5	Sept. 4	31 23.4	A. H. Hawkins.
19-16 W.—" 34	88	21	5	" 5	31 11.3	"
60-78 W.—" 34	88	21	5	" 6	31 23.2	"
10-00 N.—SE. cor. sec. 10	28	22	5	July 4	25 59.7	N. C. Stewart.
At NE. cor. sec. 10	28	22	5	" 8	26 05.9	"
50-00 N.—SE. cor. sec. 15	28	22	5	" 10	26 09.6	"
40-00 N.—" 22	28	22	5	" 17	26 12.8	"
At NE. cor. sec. 11	28	22	5	" 18	26 18.0	"
20-00 N.—SE. cor. sec. 29	28	22	5	" 22	25 42.8	"
At NE. cor. sec. 35	28	22	5	" 23	26 46.7	"
" " 33	28	22	5	" 29	26 15.2	"
20-00 W.—NE. cor. sec. 36	28	22	5	Aug. 1	26 15.0	"
At NE. cor. sec. 31	28	22	5	" 7	26 11.4	"
" " 32	28	22	5	" 8	26 19.1	"
73-00 S.—NE. cor. sec. 32	28	22	5	" 9	26 16.8	"
At NE. cor. sec. 6	29	22	5	Nov. 5	25 49.5	"
57-00 W.—NE. cor. sec. 6	29	22	5	" 6	26 00.6	"
37-35 S.—" 21	71	22	5	" 1	29 50.7	L. E. Fontaine.
38-80 N.—" 6	84	22	5	Aug. 13	31 51.7	"
At NE. cor. sec. 36	88	22	5	Sept. 10	31 43.1	A. H. Hawkins.
69-35 W.—NE. cor. sec. 36	88	22	5	" 11	31 40.7	"
16-36 W.—" 32	88	22	5	" 13	31 49.5	"
33-00 N.—SE. " 1	29	23	5	Nov. 7	26 22.0	N. C. Stewart.
27-00 N.—NE. " 1	29	23	5	" 8	26 14.9	"
3-00 W.—" 12	29	23	5	" 9	26 09.5	"
At NE. cor. sec. 11	29	23	5	" 14	26 19.0	"
25-00 S.—NE. cor.—NW. 1 sec. 23	29	23	5	" 18	26 23.5	"
6-00 E.—NE. cor. sec. 22	29	23	5	" 20	26 15.9	"
Course 3—2 Traverse of Is. N. in sec. 11	29	23	5	" 25	26 19.0	"
30-00 W.—NE. cor. sec. 10	29	23	5	" 29	26 13.9	"
" " 10	29	23	5	" 30	26 22.2	"
" " 10	29	23	5	Dec. 3	26 24.7	"
0-05 N.—" 24	70	23	5	Oct. 26	29 56.2	L. E. Fontaine.
11-37 N.—" 3	84	23	5	Aug. 16	31 48.8	"
59-54 W.—" 35	88	23	5	Sept. 19	32 05.9	A. H. Hawkins.
6-32 S.—" 3	71	24	5	Oct. 18	29 22.1	L. E. Fontaine.
0-23 N.—" 11	84	24	5	Aug. 21	30 57.6	"
75-59 W.—" 35	88	24	5	Sept. 27	32 07.6	A. H. Hawkins.
2-94 W.—" 32	88	24	5	" 28	32 00.0	"
19-85 W.—" 31	88	24	5	Oct. 3	31 44.6	"
At NE. cor. sec. 18	31	25	5	Sept. 9	26 11.0	N. C. Stewart.
12-00 W.—NE. cor. sec. 19	31	25	5	" 10	26 18.7	"
27-15 S.—" 24	69	25	5	Oct. 24	29 08.4	L. E. Fontaine.
64-85 N.—" 23	70	25	5	" 15	29 06.8	"
32-46 W.—" 35	88	25	5	" 4	32 06.1	A. H. Hawkins.
At NE. cor. sec. 32	31	26	5	Aug. 14	26 15.4	N. C. Stewart.
46-00 W.—NE. cor. sec. 32	31	26	5	" 20	26 09.3	"
42-00 N.—" 31	26	5	"	" 22	26 09.8	"
2-00 N.—" 5	32	26	5	" 15	26 16.5	"



## MAGNETIC DECLINATION.—Continued.

Place.	Tp.	Rge.	Mer.	Date	Declination.	Observer.
30-00 N.—NE. cor. sec. 6	32	26	5	Aug. 23	26 30.4	N. C. Stewart.
30-00 N.—" 7	32	26	5	" 26	26 26.6	"
18-00 E.—NW. " 30	32	26	5	" 31	26 37.0	"
8-00 E.—NE. " 30	32	26	5	Sept. 2	26 37.0	"
18-00 E.—" 30	32	26	5	" 3	26 37.0	"
40-50 E.—" 30	32	26	5	" 3	26 26.9	"
63-00 E.—" 30	32	26	5	" 5	26 16.7	"
6-00 E.—NW. " 30	32	26	5	Aug. 29	26 47.7	"
41-73 N.—NE. c r. sec. 13	48	1	6	Aug. 22	27 32.2	J. A. Fletcher.
" " 13	48	1	6	" 22	27 39.2	"
" " 13	48	1	6	" 22	27 40.5	"
7-67 N.—SE. " 36	86	1	6	Oct. 18	31 53.0	J. R. Akins.
16-70 S.—NE. " 13	86	1	6	" 19	31 42.4	"
36-67 S.—" 1	86	1	6	" 21	31 37.4	"
32-90 E.—" 32	88	1	6	" 1	32 29.2	"
55-00 E.—" 33	88	1	6	" 1	32 27.8	"
17-16 E.—" 36	88	1	6	" 3	32 08.4	"
56-69 S.—" 34	88	1	6	" 14	32 21.8	"
58-53 N.—" 25	89	1	6	" 17	32 33.6	A. H. Hawkins.
64-47 N.—" 13	89	1	6	" 15	32 21.6	"
45-03 N.—" 24	89	1	6	" 16	32 27.2	"
6-81 N.—" 12	90	1	6	" 21	32 38.5	"
20-13 N.—" 24	90	1	6	" 22	31 41.9	"
0-47 N.—" 36	90	1	6	" 23	32 47.7	"
36-72 S.—" 33	84	2	6	Sept. 6	31 34.0	L. E. Fontaine.
5-84 N.—" 16	85	2	6	" 4	31 32.8	"
12-50 W.—" 31	88	2	6	" 20	33 06.7	J. R. Akins.
29-92 E.—" 33	88	2	6	" 24	33 05.3	"
6-11 E.—" 34	88	2	6	" 25	33 02.2	"
65-80 N.—" 33	83	3	6	Aug. 28	31 36.2	L. E. Fontaine.
3-32 N.—" 2	85	3	6	Sept. 1	31 30.9	"
38-59 W.—" 32	88	3	6	" 14	33 58.2	J. R. Akins.
5-51 W.—" 32	88	3	6	" 16	33 14.6	"
10-66 E.—" 36	88	3	6	" 19	33 08.9	"
64-38 S.—" 23	81	4	6	" 13	30 21.1	L. E. Fontaine.
24-19 E.—NW. " 32	88	4	6	" 5	32 12.0	J. R. Akins.
33-14 E.—NE. " 32	88	4	6	" 7	32 25.3	"
36-18 E.—" 33	88	4	6	" 9	32 27.3	"
16-34 W.—" 35	88	4	6	" 11	32 33.7	"
66-50 W.—" 36	84	5	6	Nov. 1	29 22.5	"
58-73 W.—" 34	84	5	6	" 2	29 23.9	"
11-48 N.—" 12	85	5	6	" 18	30 08.4	"
12-75 N.—" 24	85	5	6	" 20	30 33.1	"
66-81 N.—" 24	85	5	6	" 22	30 36.3	"
46-07 N.—" 36	86	5	6	" 23	31 00.6	"
17-20 N.—" 12	86	5	6	" 25	31 21.6	"
66-62 N.—" 12	86	5	6	" 26	31 27.4	"
6-48 N.—" 36	86	5	6	" 27	31 34.2	"
40-39 W.—" 31	88	5	6	Aug. 29	31 48.5	"
2-50 W.—" 31	88	5	6	" 23	31 51.6	"
28-96 E.—" 32	88	5	6	" 30	31 42.4	"
62-78 E.—" 33	88	5	6	" 31	31 48.8	"
4-55 W.—" 35	88	5	6	Sept. 2	31 49.4	"
3-23 E.—" 36	88	5	6	" 2	31 43.1	"
15-31 E.—" 36	88	5	6	" 4	32 04.0	"
17-00 S.—" 7	19	6	6	" 15	26 18.7	"
6-96 N.—" 23	74	6	6	" 19	29 10.8	L. E. Fontaine.
2-08 N.—" 23	75	6	6	" 27	29 48.3	"
0-41 S.—" 13	75	6	6	" 29	30 27.2	"
40-47 W.—" 36	84	6	6	Nov. 6	29 52.7	J. R. Akins.
3-14 W.—" 34	84	6	6	" 7	30 26.3	"
3-78 W.—" 33	84	6	6	" 8	30 59.3	"
At NE. cor. sec. 32	84	6	6	" 9	30 57.6	"
74-04 N.—NE. cor. sec. 1	85	6	6	Dec. 2	30 08.8	"
43-72 W.—" 31	88	6	6	Aug. 14	32 02.7	"
65-25 E.—" 31	88	6	6	" 15	32 01.7	"
28-40 W.—" 34	88	6	6	" 17	31 35.3	"
46-43 E.—" 35	88	6	6	" 28	31 40.4	"
40-30 S.—" 32	18	7	6	May 28	25 20.2	N. C. Stewart.
2-00 N.—SE. " 30	18	7	6	" 30	26 04.1	"
34-00 N.—" 6	19	7	6	" 31	26 31.6	"



## SESSIONAL PAPER No. 25b

## MAGNETIC DECLINATION.—Continued.

Place.	Tp.	Rge.	Mer	Date.	Declination.	Observer.
4-75 S.—NE. cor. sec. 7.	19	7	6	June 3	26 00-3	N. C' Stewart.
26-16 W.—" 32.	88	7	6	Aug. 6	30 54-1	J. R. Akins.
39-35 E.—" 32.	88	7	6	" 9	31 08-5	"
22-26 E.—" 35.	88	7	6	" 13	31 51-4	"
5-00 N.—" 10.	18	8	6	June 6	26 12-0	N. C. Stewart.
At NE. cor. sec. 11.	18	8	6	" 10	25 18-1	"
At SE. " 2.	18	8	6	" 14	25 31-1	"
At NE. " 15.	18	8	6	Oct. 25	25 40-2	"
At NE. " 10.	20	8	6	" 29	26 04-3	"
8-00 W.—NE. cor. SE. $\frac{1}{4}$ sec. 15.	20	8	6	" 30	26 03-6	"
24-00 N.—NE. cor. SW. $\frac{1}{4}$ sec. 15.	20	8	6	" 31	26 01-4	"
33-38 N.—NE. cor. sec. 27.	74	8	6	" 5	30 13-9	L. E. Fontaine.
10-34 S.—" 12.	75	8	6	" 5	30 00-3	"
39-76 E.—" 33.	88	8	6	July 31	30 34-9	J. R. Akins.
" 33.	88	8	6	Aug. 1	30 35-4	"
38-07 E.—" 35.	88	8	6	" 3	30 35-3	"
At NE. cor. sec. 22.	19	9	6	" 26	24 57-0	M.P. Bridgland.
17-80 N.—NE. cor. sec. 15.	19	9	6	Oct. 2	25 51-9	J. A. Fletcher.
" 15.	19	9	6	" 3	25 52-1	"
44-00 N.—SW. " 6.	19	9	6	" 5	25 36-3	N. C. Stewart.
22-00 N.—" 7.	19	9	6	" 7	25 43-9	"
52-00 N.—" 7.	19	9	6	" 8	25 33-3	"
50-00 W.—NE. " 7.	19	9	6	" 9	25 48-0	"
9-00 N.—SW. " 18.	19	9	6	" 10	25 36-4	"
51-00 N.—" 18.	19	9	6	" 11	25 30-6	"
30-00 N.—SE. " 19.	19	9	6	" 15	25 25-7	"
3-50 N.—" 30.	19	9	6	" 18	25 24-5	"
46-00 N.—NE. " 19.	19	9	6	" 21	25 42-5	"
25-00 S.—" 31.	19	9	6	" 23	25 36-7	"
12-00 N.—N. by sec. 6—W. by Okanagan I.R. No. 1.	17	10	6	Sept. 26	25 29-0	"
Cor. of Jog—W. by Okanagan I.R. No. 1—Sec. 8.	17	10	6	" 27	25 29-7	"
At NE. cor. sec. 32.	19	10	6	Oct. 2	25 43-7	M.P. Bridgland.
" 32.	19	10	6	" 2	25 45-9	"
1-50 N. 54° 33' E. of NE. end of base line at Salmon Arm.	20	10	6	May 10	25 42-9	J. A. Fletcher.
1-50 N. 54° 33' E. of NE. end of base line at Salmon Arm.	20	10	6	" 10	25 42-6	"
1-50 N. 54° 33' E. of NE. end of base line at Salmon Arm.	20	10	6	" 11	25 39-2	"
1-50 N. 54° 33' E. of NE. end of base line at Salmon Arm.	20	10	6	" 11	25 37-3	"
1-50 N. 54° 33' E. of NE. end of base line at Salmon Arm.	20	10	6	" 13	25 43-1	"
1-50 N. 54° 33' E. of NE. end of base line at Salmon Arm.	20	10	6	" 13	25 42-5	"
1-50 N. 54° 33' E. of NE. end of base line at Salmon Arm.	20	10	6	" 14	25 44-1	"
1-50 N. 54° 33' E. of NE. end of base line at Salmon Arm.	20	10	6	" 15	25 43-1	"
1-50 N. 54° 33' E. of NE. end of base line at Salmon Arm.	20	10	6	" 16	25 43-8	"
37-00 S.—NE. cor. sec. 9.	20	10	6	" 17	25 44-4	"
" 9.	20	10	6	" 17	25 52-2	M.P. Bridgland.
At NE. cor. sec. 9.	20	10	6	" 17	25 57-2	"
" 9.	20	10	6	June 9	25 57-8	"
" 10.	20	10	6	Nov. 6	25 54-3	"
" 5.	20	10	6	" 6	25 47-0	"
40-25 S.—NE. cor. sec. 5.	20	10	6	" 6	26 07-7	"
" 5.	20	10	6	" 6	25 49-5	"
At NE. cor. sec. 4.	20	10	6	Oct. 2	25 47-8	"
40-00 N.—NE. cor. sec. 29.	23	14	6	Nov. 6	25 44-9	"
81-14 E.—NE. cor. S. $\frac{1}{4}$ sec. 6.	24	14	6	Sept. 19	26 13-4	C. H. Taggart.
" 6.	24	14	6	" 22	26 05-8	"
" 6.	24	14	6	" 22	26 13-2	"
" 6.	24	14	6	" 22	26 12-6	"
" 6.	24	14	6	" 22	26 09-5	"
" 6.	24	14	6	" 22	26 09-5	"
" 6.	24	14	6	" 22	26 06-4	"



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## MAGNETIC DECLINATION.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	Declination.	Observer.
81.14 E.—NE. cor. S $\frac{1}{2}$ sec. 6.....	24	14	6	Sept. 22	26 12.6	C. H. Taggart.
“ “ “ 6.....	24	14	6	“ 22	26 06.6	“
“ “ “ 6.....	24	14	6	“ 22	26 10.7	“
“ “ “ 6.....	24	14	6	“ 22	26 13.5	“
60.25 N.—NE. cor. sec. 8.....	24	14	6	“ 23	25 57.9	“
60.00 N.—“ “ 20.....	24	14	6	Oct. 5	26 17.4	“
10.00 N.—“ “ 27.....	20	15	6	“ 31	30 05.1	“
40.00 E.—“ “ 34.....	20	15	6	“ 30	29 26.3	“
At NE. cor. sec. 29.....	20	15	6	Nov. 4	27 52.9	“
40.25 E.—NW. cor. sec. 18.....	23	15	6	July 31	25 24.0	“
65.25 S.—NE. “ 11.....	24	15	6	Aug. 29	26 48.5	“
45.00 N.—“ “ 3.....	24	15	6	“ 19	25 40.3	“
43.00 E.—“ “ 4.....	22	16	6	June 5	26 58.5	“
70.00 N.—“ “ 3.....	22	16	6	“ 20	26 50.6	“
54.00 N.—“ “ 12.....	23	16	6	July 30	25 54.1	“
At NE. cor. sec. 3.....	26	16	6	“ 26	25 49.3	“
4.50 E.—NE. cor. sec. 22.....	21	17	6	May 7	26 00.4	“
30.00 S.—“ “ 23.....	21	17	6	“ 7	26 15.1	“
40.00 W.—“ “ 15.....	21	17	6	“ 17	26 12.2	“
34.00 S.—“ “ 28.....	21	17	6	“ 18	26 26.2	“
20.00 S.—“ “ 21.....	21	17	6	“ 20	25 43.6	“
40.00 E.—“ “ 23.....	22	17	6	“ 29	26 32.6	“
1.00 W.—“ “ 14.....	22	17	6	“ 30	27 09.9	“
50.00 E.—“ “ 15.....	18	18	6	Dec. 4	26 07.0	“
35.00 N.—“ “ 23.....	18	18	6	“ 6	26 02.5	“
At NE. cor. sec. 21.....	18	18	6	“ 7	26 01.3	“
10.00 N.—NE. cor. sec. 10.....	18	18	6	“ 12	26 18.0	“
31.57 W.—NE. cor. sec. 34.....	76	18	6	April 6	30 18.6	J. R. Akins.
66.92 W.—“ “ 32.....	76	18	6	“ 15	30 10.9	“
21.00 N.—“ “ 21.....	84	18	6	May 10	31 40.3	L. Brenot.
20.00 N.—“ “ 1.....	84	18	6	June 5	31 20.7	“
0.70 W.—“ “ 35.....	76	19	6	April 18	29 58.2	J. R. Akins.
4.78 W.—“ “ 35.....	76	19	6	“ 18	29 56.8	“
26.43 W.—“ “ 34.....	76	19	6	“ 19	29 54.4	“
79.70 W.—“ “ 34.....	76	19	6	“ 20	29 52.8	“
47.84 W.—“ “ 33.....	76	19	6	“ 23	29 52.9	“
77.01 W.—“ “ 32.....	76	19	6	“ 24	29 50.8	“
77.01 W.—“ “ 32.....	76	19	6	“ 24	29 50.5	“
40.00 S.—“ “ 36.....	83	19	6	July 31	31 47.8	L. Brenot.
At NE. cor. sec. 8.....	84	19	6	April 16	31 12.5	“
20.00 N.—NE. cor. sec. 24.....	84	19	6	“ 22	31 32.5	“
11.00 S.—“ “ 2.....	84	19	6	July 1	31 24.0	“
25.35 W.—“ “ 36.....	76	20	6	April 25	29 56.9	J. R. Akins.
64.75 W.—“ “ 31.....	76	20	6	May 6	30 22.4	“
43.00 W.—“ “ 18.....	20	21	6	Dec. 13	25 14.5	J. A. Calder.
At NE. cor. sec. 36.....	76	21	6	May 7	30 30.2	J. R. Akins.
58.08 W.—NE. cor. sec. 36.....	76	21	6	“ 8	30 32.8	“
50.38 W.—“ “ 34.....	76	21	6	“ 13	30 29.6	“
5.80 W.—“ “ 33.....	76	21	6	“ 14	30 36.9	“
13.28 W.—“ “ 32.....	76	21	6	“ 15	30 37.8	“
65.70 W.—“ “ 31.....	76	21	6	“ 20	30 44.5	“
0.50 W.—“ “ 31.....	76	21	6	“ 18	30 40.4	“
6.00 N.—“ “ 24.....	20	22	6	Dec. 7	26 12.0	J. A. Calder.
30.73 W.—“ “ 36.....	76	22	6	May 21	30 49.4	J. R. Akins.
58.53 W.—“ “ 36.....	76	22	6	“ 22	30 44.2	“
7.20 W.—“ “ 34.....	76	22	6	“ 24	30 47.9	“
9.03 W.—“ “ 33.....	76	22	6	“ 25	30 53.4	“
0.58 W.—“ “ 32.....	76	22	6	“ 27	31 03.1	“
17.90 W.—“ “ 32.....	76	22	6	“ 28	31 01.2	“
17.90 W.—“ “ 32.....	76	22	6	“ 29	31 03.8	“
73.31 W.—“ “ 31.....	76	22	6	“ 31	31 07.6	“
64.00 E.—“ “ 32.....	83	22	6	Oct. 27	31 53.2	L. Brenot.
16.08 E.—“ “ 1.....	14	23	6	Aug. 9	24 51.8	J. A. Calder.
5.00 W.—“ “ 35.....	20	23	6	Nov. 29	27 26.8	“
40.26 W.—“ “ 36.....	76	23	6	June 1	31 16.9	J. R. Akins.
23.30 W.—“ “ 34.....	76	23	6	“ 4	31 26.6	“
16.16 W.—“ “ 32.....	76	23	6	“ 7	31 24.3	“
At NE. cor. sec. 12.....	84	23	6	Oct. 24	32 01.4	L. Brenot.
7.60 S.— $\frac{1}{4}$ on E. by sec. 29.....	16	24	6	June 22	26 45.3	J. A. Calder.
48.18 W.—NE. cor. sec. 35.....	76	24	6	“ 12	31 12.5	J. R. Akins.
57.37 W.—“ “ 34.....	76	24	6	“ 13	31 07.7	“



## SESSIONAL PAPER No. 25b

## MAGNETIC DECLINATION.—Continued.

Place.	Tp.	Rge.	Mer.	Date.	Declination.	Observer.
9-62 W.—NE. cor. sec. 33.....	76	24	6	June 15	31 01-9	J. R. Akins.
73-70 W.—“ 33.....	76	24	6	“ 17	31 04-3	“
31-57 W.—“ 31.....	76	24	6	“ 20	30 55-4	“
29-00 W.—“ 33.....	16	25	6	July 10	25 04-2	J. A. Calder.
Sta. 27 Traverse left bank Thompson river....	16	25	6	“ 18	27 19-7	“
NW. cor. of Oregon Jack, I. R. No. 1.....	19	25	6	Dec. 18	26 05-7	“
17-19 W.—NE. cor. sec. 36.....	76	25	6	June 22	31 05-6	J. R. Akins.
41-44 W.—“ 33.....	76	25	6	“ 24	31 02-5	“
60-08 W.—“ 31.....	76	25	6	“ 29	31 17-9	“
8-00 N.—“ 18.....	81	25	6	Sept. 17	31 24-8	L. Brenot.
Yola Cr. Traverse Sta. 73 Sec. 10.....	3	26	6	July 8	24 17-5	A. Lighthall.
About 15-00 NW.— $\frac{1}{4}$ post N. by Sec. 13.....	3	26	6	“ 27	25 14-2	“
20-50 SW.—SE. cor. T. B. 554, Bk. 2.....	4	26	6	Aug. 13	25 18-6	“
20-49 S.—NW. cor. T. B. 554, Bk. 2.....	4	26	6	“ 14	25 37-5	“
9-55 E.—NE. cor. sec. 2.....	4	26	6	Nov. 19	23 57-4	“
At NE. cor. sec. SW. $\frac{1}{4}$ sec. 5.....	5	26	6	June 10	25 32-1	“
21-53 E.—NE. cor. sec. 35.....	7	26	6	Sept. 30	25 38-6	P. Melhuish.
55-13 W.—Centre sec. 26.....	8	26	6	May 24	25 58-6	“
52-00 E.— $\frac{1}{4}$ post E. by sec. 22.....	8	26	6	June 1	26 19-2	“
74-70 S.—NE. cor. sec. 23.....	8	26	6	“ 4	26 59-9	“
35-00 S.—“ 14.....	8	26	6	“ 5	28 05-5	“
At NE. cor. sec. 11.....	8	26	6	“ 6	26 07-5	“
3-15 W.—NE. cor. sec. 1.....	8	26	6	“ 18	25 16-3	“
20-02 S.—“ 33.....	10	26	6	Nov. 7	25 57-9	“
43-00 S.—“ 28.....	10	26	6	“ 14	26 12-2	“
5-00 E.—“ 21.....	10	26	6	“ 15	26 11-4	“
3-00 N.— $\frac{1}{4}$ cor.—N. by sec. 22.....	10	26	6	“ 16	26 17-1	“
30-75 W.—NE. cor. sec. 28.....	11	26	6	Oct. 15	26 38-2	“
70-00 W.—“ 28.....	11	26	6	“ 16	26 09-6	“
30-00 N.—“ 27.....	11	26	6	“ 18	26 17-9	“
25-00 N.— $\frac{1}{4}$ cor. N. by sec. 23.....	11	26	6	“ 30	25 57-9	“
18-27 S.—NE. cor. sec. 15.....	11	26	6	“ 4	25 55-1	“
51-46 S.—“ 15.....	11	26	6	“ 5	25 44-9	“
At NE. cor. sec. 15.....	11	26	6	“ 7	25 50-5	“
2-60 N.— $\frac{1}{4}$ cor.—N. by sec. 15.....	11	26	6	“ 8	25 53-2	“
3-55 W.—Centre sec. 22.....	11	26	6	“ 9	25 59-5	“
4-82 E.— $\frac{1}{4}$ cor.—E. by sec. 21.....	11	26	6	“ 10	26 05-2	“
14-97 S.—NE. cor. sec. 21.....	11	26	6	“ 11	26 15-4	“
34-21 N.—“ 21.....	11	26	6	“ 12	26 10-5	“
At NE. cor. sec. 28.....	11	26	6	“ 14	25 27-8	“
10-00 W.—NE. cor. lot 1471.....	15	26	6	“ 27	26 20-1	J. A. Calder.
Centre sec. 10.....	16	26	6	Nov. 13	25 54-6	“
9-70 W.—NE. cor. sec. 35.....	76	26	6	July 2	31 15-1	J. R. Akins.
10-00 N.—“ 13.....	81	26	6	Aug. 30	31 21-2	L. Brenot.
70-25 E.—NW. “ 31.....	4	27	6	Nov. 6	24 20-2	A. Lighthall.
37-72 E.—“ 30.....	4	27	6	“ 15	24 04-7	“
63-29 N.—NE. “ 24.....	12	27	6	“ 25	26 09-1	P. Melhuish.
20-00 E.—“ 25.....	12	27	6	“ 27	25 39-8	“
65-00 E.—“ 25.....	12	27	6	“ 28	25 55-2	“
Sta. 66 Traverse right bank Stein river.....	15	27	6	Aug. 28	26 17-9	J. A. Calder.
28-00 E.—NW. cor. sec. 9.....	4	28	6	Dec. 6	26 15-0	A. Lighthall.
15-00 E.—NE. “ 29.....	15	28	6	Sept. 12	26 11-4	J. A. Calder.
8-00 E.—“ 34.....	15	29	6	Oct. 9	25 54-3	“
10-00 E.—“ 15.....	6	5	7	“ 1	26 01-5	A. Lighthall.
10-00 S.—“ 29.....	6	5	7	Sept. 19	25 27-7	“
4-00 E.—NW. “ 2.....	6	7	7	Aug. 21	26 34-0	“
5-00 W.—NE. “ 12.....	6	7	7	Sept. 4	25 50-2	“
5-00 S.—“ 20.....	19	.....	F.C.	Oct. 12	24 57-5	“



MAGNETIC DIP AND TOTAL INTENSITY.

Place.	Tp.	Rge.	Mer.	Date.	Time.	Dip.	Time.	Total Intensity. C.G.S.	Observer.
40-00 W. 10-00 S.—NE. cor. sec. 18.	40	22	3	14-10-10	9.03 A	77 26-8	9.30 A	.62752	D. E. Charttrand.
" " " " " "	40	22	3	14-10-10	9.58 A	77 26-3	10.25 A	.62773	"
10-00 S. 15-00 E.— $\frac{1}{4}$ p. W. by 31.	37	24	3	23-10-10	1.57 P	77 15-2	2.27 P	.62519	"
" " " " " "	37	24	3	23-10-10	2.54 P	77 13-9	3.19 P	.62563	"
5-00 S.— $\frac{1}{4}$ p. E. by sec. 9.	21	4	2	15-6-10	3.30 P	77 42-8	4.10 P	.63169	"
" " " " " "	21	4	2	15-6-10	4.45 P	77 39-7	5.25 P	.63164	"
" " " " " "	21	4	2	15-6-10	5.57 P	77 41-5			"
" " " " " "	21	4	2	19-6-10	8.47 A	77 43-5		.63176	"
" " " " " "	21	4	2	19-6-10	10-07 A	77 43-0	10.40 A	.63171	"
" " " " " "	21	4	2	19-6-10	11.15 A	77 43-6			"
30-00 W. 10-00 S.—NE. cor. sec. 3.	35	1	3	31-7-10	9.18 A	77 34-5	9.51 A	.63488	"
20-00 S. 3-00 E.—NE. cor. sec. 12.	34	3	3	3-8-10	1.45 P	77 38-9	2.27 P	.63364	"
" " " " " "	34	3	3	3-8-10	3.07 P	77 39-8	3.35 P	.63359	"
22-00 N. 35-00 W.—SE. cor. sec. 9.	33	4	3	10-8-10	2.24 P	77 19-7	3.09 P	.63179	"
15-00 N. 14-00 W.—NE. cor. sec. 36.	38	5	3	12-8-10	2.21 P	77 52-1	2.56 P	.62991	"
" " " " " "	38	5	3	12-8-10	3.34 P	77 53-2	4.03 P	.63004	"
At NE. cor. sec. 29.	22	6	2	9-6-10	2.46 P	77 48-8	3.39 P	.63061	"
" " " " " "	22	6	2	9-6-10	4.24 P	77 48-5	4.54 P	.63122	"
" " " " " "	22	6	2	9-6-10	5.24 P	77 50-3			"
" " " " " "	22	6	2	12-6-10	9.49 A	77 49-9	10.36 A	.63103	"
" " " " " "	22	6	2	12-6-10	11.16 A	77 50-5	11.54 A	.63167	"
" " " " " "	22	6	2	12-6-10	12.24 P	77 50-7			"
22-00 N. 35-00 W.—SE. cor. sec. 9.	33	4	3	9-10-10	9.39 A	77 21-6	10.06 A	.63103	"
" " " " " "	33	4	3	9-10-10	10.39 A	77 22-3	11.09 A	.63104	"
5-00 N. 25-00 W.—NE. cor. sec. 22.	32	16	2	17-7-10	9.25 A	78 15-6	10-00 A	.63355	"
" " " " " "	32	16	2	17-7-10	10-28 A	78 16-1	10-58 A	.63238	"
" " " " " "	32	16	2	17-7-10	11.30 A	78 15-8			"
10-00 W.—Centre sec. 36.	32	20	2	27-7-10	7.13 P	78 03-4	7.43 P	.63304	"
30-00 W.—NE. cor. sec. 3.	35	1	3	30-7-10	4.36 P	77 35-7	5.01 P	.63551	"
" " " " " "	35	1	3	30-7-10	5.31 P	77 33-0	5.53 P	.63587	"
" " " " " "	35	1	3	30-7-10	6.36 P	77 33-4			"
At NE. cor. sec. 8.	26	12	2	6-7-10	2.15 P	77 53-1	2.47 P	.63163	"
" " " " " "	26	12	2	6-7-10	3.20 P	77 53-7	4.00 P	.63138	"
" " " " " "	26	12	2	6-7-10	4.30 P	77 54-3			"
3-00 E. of NE. cor. sec. 22.	33	22	2	16-7-10	1.30 P	78 01-0	2.02 P	.63286	"
" " " " " "	33	22	2	16-7-10	2.30 P	78 02-6	2.55 P	.63215	"
" " " " " "	33	22	2	16-7-10	3.25 P	78 02-1			"
20-00 N.—NE. cor. sec. 17.	36	27	Pr.	31-5-10	3.05 P	79 05-2	3.52 P	.63924	"
" " " " " "	36	27	Pr.	31-5-10	4.47 P	79 04-7			"
" " " " " "	36	27	Pr.	1-6-10	9.25 A	79 10-8	10.17 A	.63872	"
" " " " " "	36	27	Pr.	1-6-10	11.00 A	79 10-3			"



## SESSIONAL PAPER No. 10d

20-00 N—NE. cor. sec. 17.	36	27	Pr.	3-6-10	1.05 P	79	05-9	1.42 P	.63915	D. E. Chartrand.
" "	36	27	Pr.	3-6-10	2.25 P	79	05-9	2.57 P	.63921	"
5-00 N, 15-00 E.— $\frac{1}{4}$ E. by 29.	45	21	2	1-9-10	9.20 A	79	04-3	11.00 A	.63019	"
20-00 S—SE. cor. sec. 5.	49	26	2	3-9-10	1.57 P	79	13-5	2.32 P	.63983	"
At $\frac{1}{4}$ post W. by sec. 30.	43	26	2	3-9-10	3.00 P	79	12-9	3.30 P	.63381	"
" "	43	26	2	12-9-10	11.24 A	77	42-3	12.00 M	.63441	"
20-00 S, 20-00 E.—NW. cor. sec. 7.	43	16	3	12-9-10	12.32 P	77	42-3	1.12 P	.62755	"
" "	45	18	2	6-10-10	9.49 A	79	03-2	10.22 A	.62752	"
15-00 W.—NE. cor. sec. 18.	45	18	2	6-10-10	10.54 A	79	03-0	11.27 A	.63142	"
" "	48	25	3	25-9-10	9.36 A	78	18-5	10.11 A	.63205	"
10-00 S, 10-00 E.— $\frac{1}{4}$ P.W. by 6.	48	25	3	25-9-10	10.48 A	78	20-2	11.26 A	.62744	"
" "	39	2	3	29-9-10	8.10 A	78	15-2	8.40 A	.62742	"
20-00 S.—SE. cor. sec. 5.	39	2	3	29-9-10	9.12 A	78	14-8	9.52 A	.63393	"
10-00 S, 5-00 E.—NE. cor. 19.	49	26	2	1-10-10	10.07 A	79	13-3	10.39 A	.63537	"
" "	49	26	2	1-10-10	11.09 A	79	13-3	11.37 A	.63447	"
30-00 S, 5-00 E.—NE. cor. 34.	37	22	2	18-8-10	8.45 A	78	28-7	9.20 A	.63394	"
" "	37	22	2	18-8-10	9.52 A	78	29-6	10.25 A	.63292	"
At NE. cor. sec. 12.	42	3	3	23-8-10	8.25 A	78	14-6	9.02 A	.63297	"
" "	42	3	3	23-8-10	9.47 A	78	15-3	10.27 A	.63695	"
Churchill East Peninsula—Lat 58° 47' 34", long. 94° 10' 00".	49	4	3	27-8-10	9.44 A	78	45-1	10.24 A	.63666	"
" "	49	4	3	27-8-10	10.59 A	78	45-4	11.31 A	.62920	"
" "	49	4	3	23-8-08	11.48 A	78	45-4	11.31 A	.62964	J. E. Morrier.
" "				23-8-08	3.11 P	84	38-0	12.44 P	.63740	"
Churchill West Peninsula—Lat. 58° 46' 47", long. 94° 11' 00".				30-8-08	11.32 A	84	41-3	12.34 P	.63567	"
" "				30-8-08	3.48 P	84	34-1	4.27 P	.63593	"
" "				22-9-08	10.55 A	84	33-5	11.55 A	.64007	"
" "				22-9-08	2.05 P	84	35-1	2.50 P	.63681	"
H. B. Post, Norway House—Lat. 53° 58' 00", long. 97° 52' 00".				1-11-08	11.20 A	84	35-4	12.17 P	.63987	"
" "				1-11-08	1.00 P	84	36-9	1.36 P	.63876	"
" "				18-6-08	10.44 A	80	58-9	12.01 P	.63876	"
" "				18-6-08	1.35 P	80	58-2	2.28 P	.63769	"
" "				21-6-08	10.14 A	80	58-0	11.14 A	.63887	"
H. B. Post, Oxford House—Lat. 54° 53' 30", long. 95° 45' 00".				21-6-08	1.38 P	80	57-1	2.22 P	.63978	"
" "				27-6-08	12.12 P	82	31-6	12.57 P	.64218	"
H. B. Post, York Factory—Lat. 57° 00' 00", long. 92° 28' 00".				27-6-08	2.19 P	82	31-9	2.54 P	.64093	"
" "				7-7-08	4.48 P	83	32-9	5.35 P	.63234	"
" "				8-7-08	9.52 A	83	27-4	10.24 A	.63413	"
" "				8-7-08	2.24 P	83	27-0			"
" "				8-7-08	5.20 P	83	30-9	5.57 P	.63486	"
" "				10-7-08	9.04 A	83	27-5	9.46 A	.63539	"
71-11 N 71-01 E.—NE. cor. sec. 7.	66	22	4	10-7-08	10.40 A	83	36-3	11.12 A	.63200	Carl Engler.
" "	66	22	4	19-5-10	10.40 A	78	04-5	11.24 A	.62146	"
" "	66	22	4	19-5-10	12.10 P	78	03-1			"
" "	66	22	4	20-5-10	2.32 P	78	04-3	3.27 P	.62137	"
" "	66	22	4	20-5-10	3.44 P	78	00-6			"
Grand Rapids, Athabaska river.	84	17	4	31-5-10	10.04 A	79	28-5	11.18 A	.62259	J. A. Cote.
" "	84	17	4	31-5-10	12.42 P	79	28-6			"
" "	84	17	4	1-6-10	9.30 A	79	27-3	10-21 A	.62217	Carl Engler.
" "	84	17	4	1-6-10	11.06 A	79	26-8			"



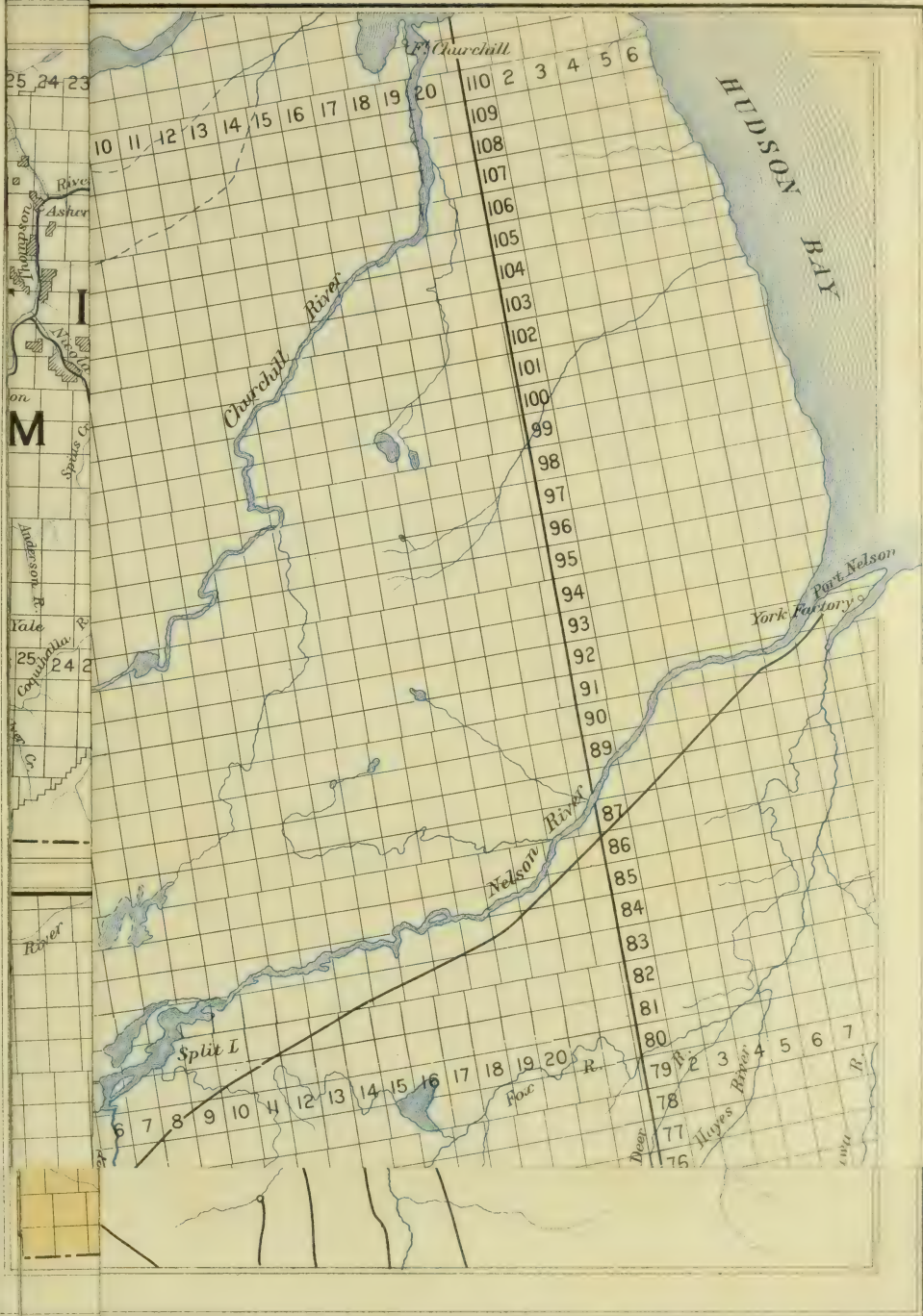




# AI

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Scale, 35 miles to an inch  $\frac{1}{2217600}$



ZINCOGRAPHED AT THE SURVEYOR GENERAL'S OFFICE OTTAWA CANADA

Sub no British Columbia are not shown owing to their scattered nature.  
 Sub March 31, 1913  
 Rest prior to March 31, 1913

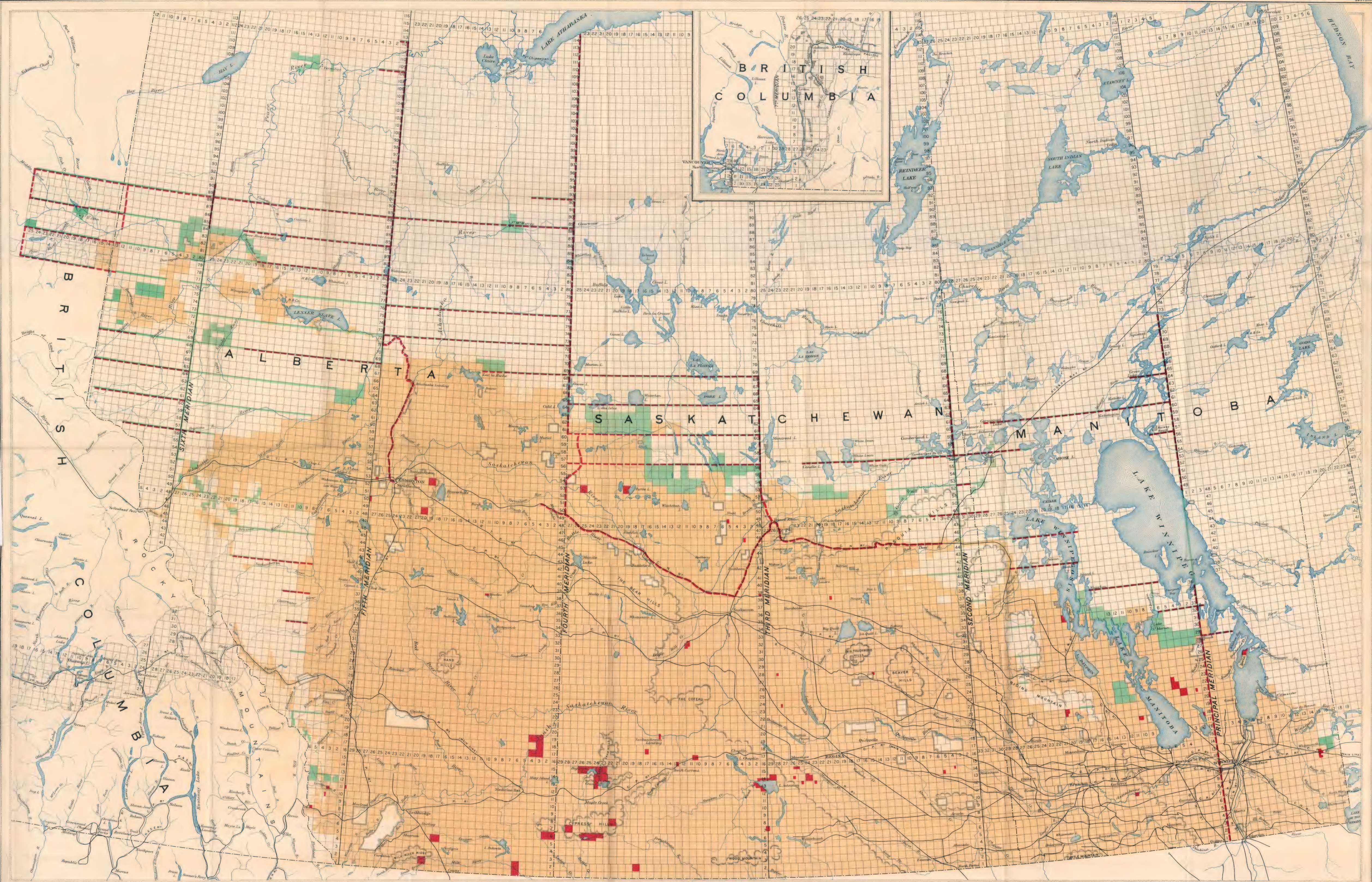


# INDEX TO TOWNSHIPS IN MANITOBA, SASKATCHEWAN, ALBERTA AND BRITISH COLUMBIA

Annual report of the Topographical Surveys Branch, Department of the Interior, 1912-1913.

To illustrate Progress of Dominion Lands Surveys

Scale, 85 miles to an inch.

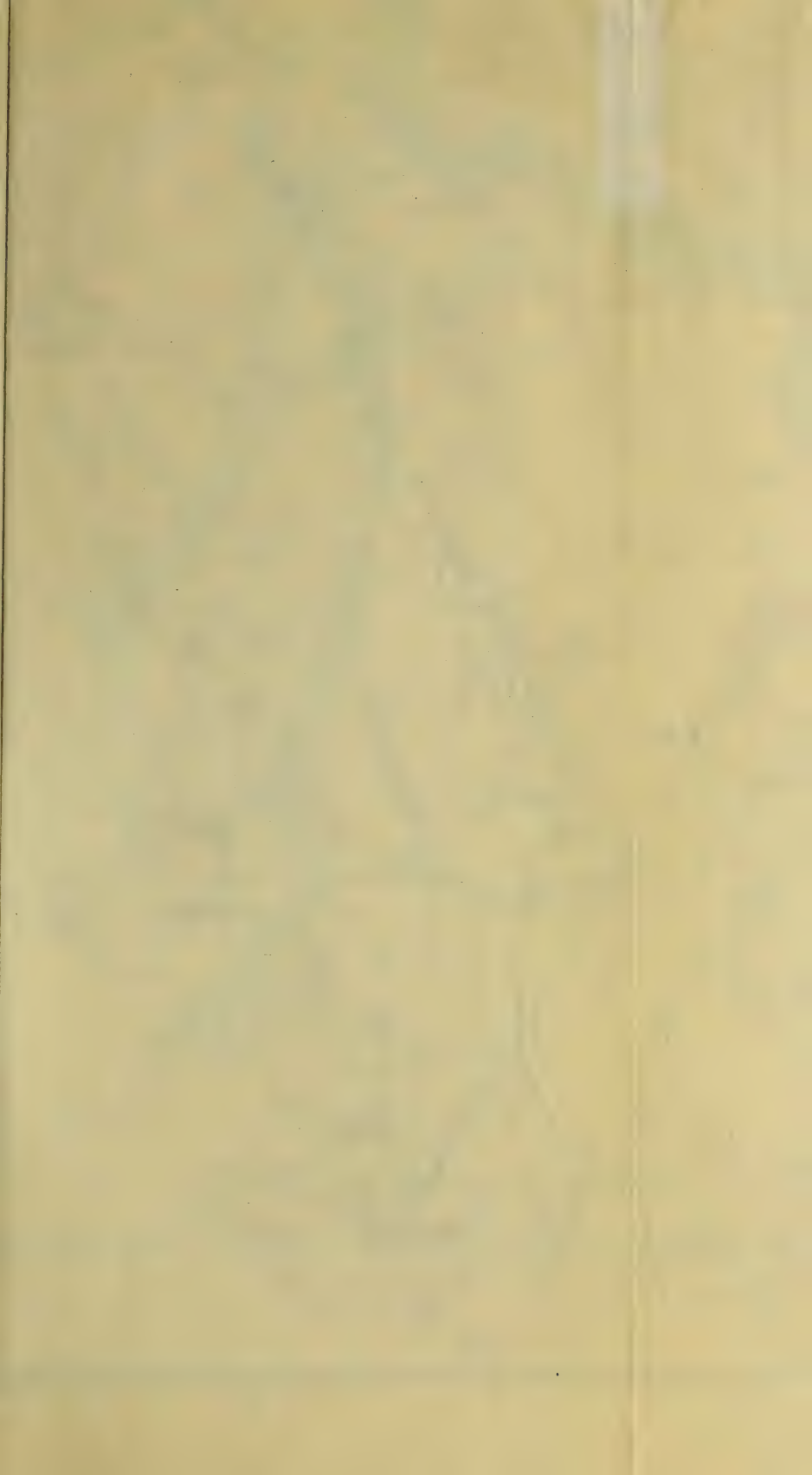


Subdivision surveys made prior to March 31, 1912. . . . .  
Subdivision surveys made from April 1, 1912 to March 31, 1913. . . . .  
Resurveys made from April 1, 1912 to March 31, 1913. . . . .

CAUTION:—This is only an index, topographical and other features are not to be depended upon.

Surveys in the Railway Belt in British Columbia are not shown owing to their scattered nature.  
Lines of spirit levels run prior to March 31, 1913.  
Base and meridian lines run prior to March 31, 1913.







# SKETCH MAP OF PART OF THE RAILWAY BELT BRITISH COLUMBIA

Showing main topographical features in the district  
lying south of Shuswap lake.

Scale: 4 miles to an inch.

## NOTE

Primary triangulation stations and triangles are in red.  
Secondary triangulation stations and triangles are in blue.  
Elevations are in feet above sea-level.





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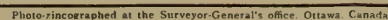
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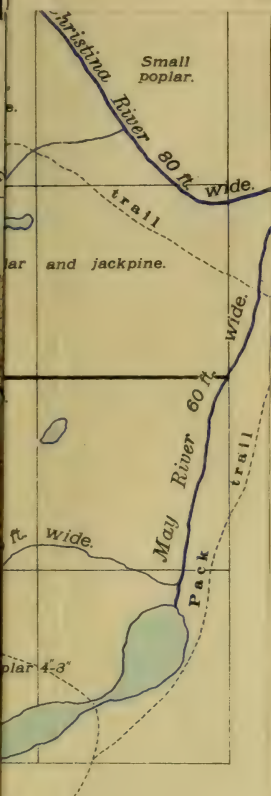
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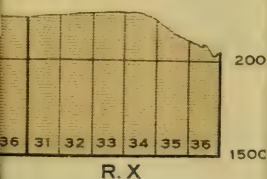




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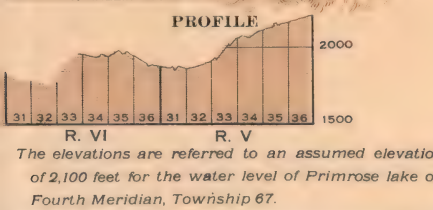
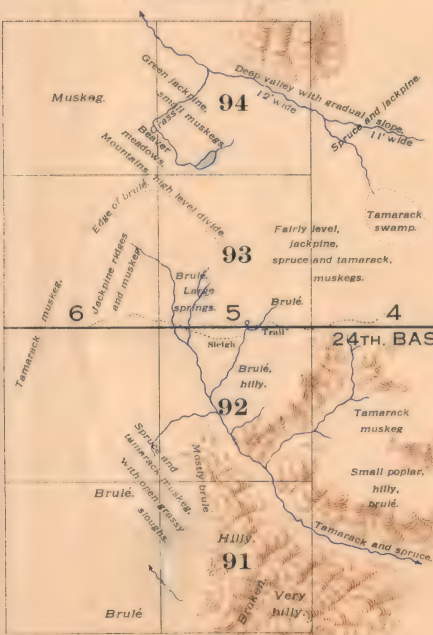
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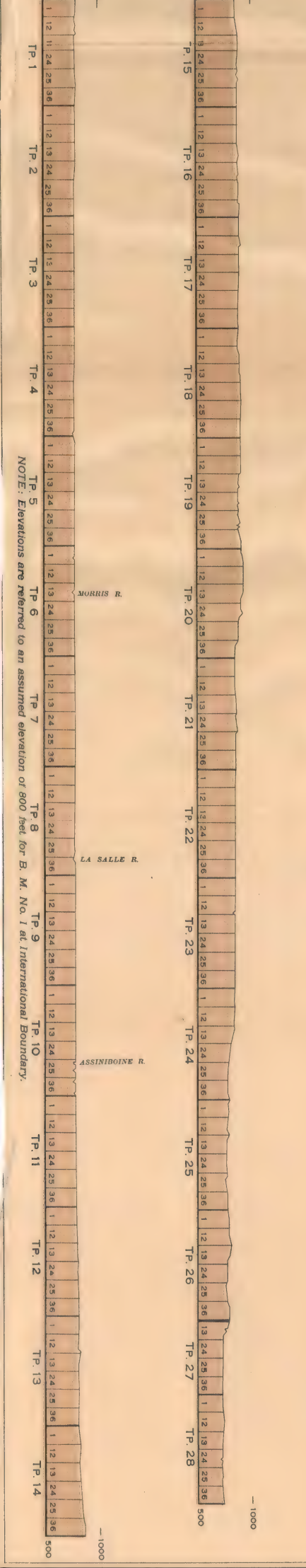
TWENTY-FOURTH BASE LINE

Ranges 5 and 6, West of Fourth Meridian, surveyed by J. B. McFarlane, D.L.S., 1912



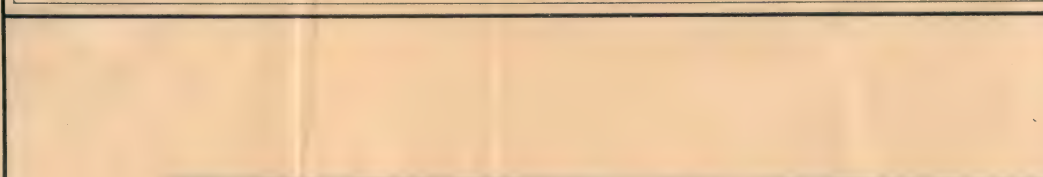
PROFILE OF PRINCIPAL MERIDIAN

Townships 1 to 28, by A. G. Stuart, D.L.S., 1912.



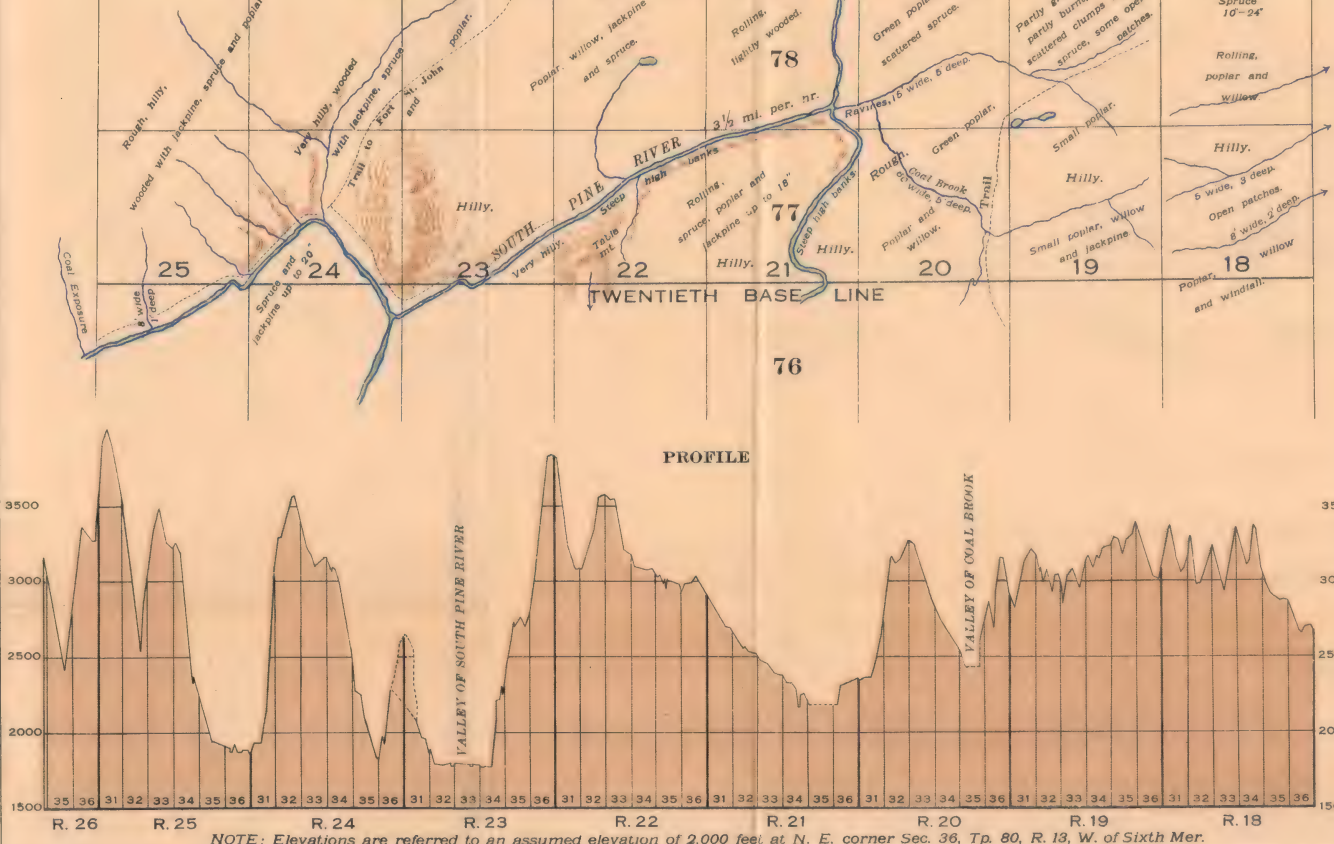
FOURTH MERIDIAN

Townships 106 to 115, surveyed by J. B. McFarlane, D.L.S., 1912



TWENTIETH BASE LINE

Ranges 18 to 25 West of Sixth Meridian, surveyed by J. R. Akins, D.L.S., 1912



PROFILE

NOTE: Elevations are referred to an assumed elevation of 2,000 feet at N. E. corner Sec. 36, Tp. 80, R. 13, W. of Sixth Mer.

TWENTY-THIRD BASE LINE

Ranges 1 to 8, West of Sixth Meridian, surveyed by J. R. Akins, D.L.S., 1912

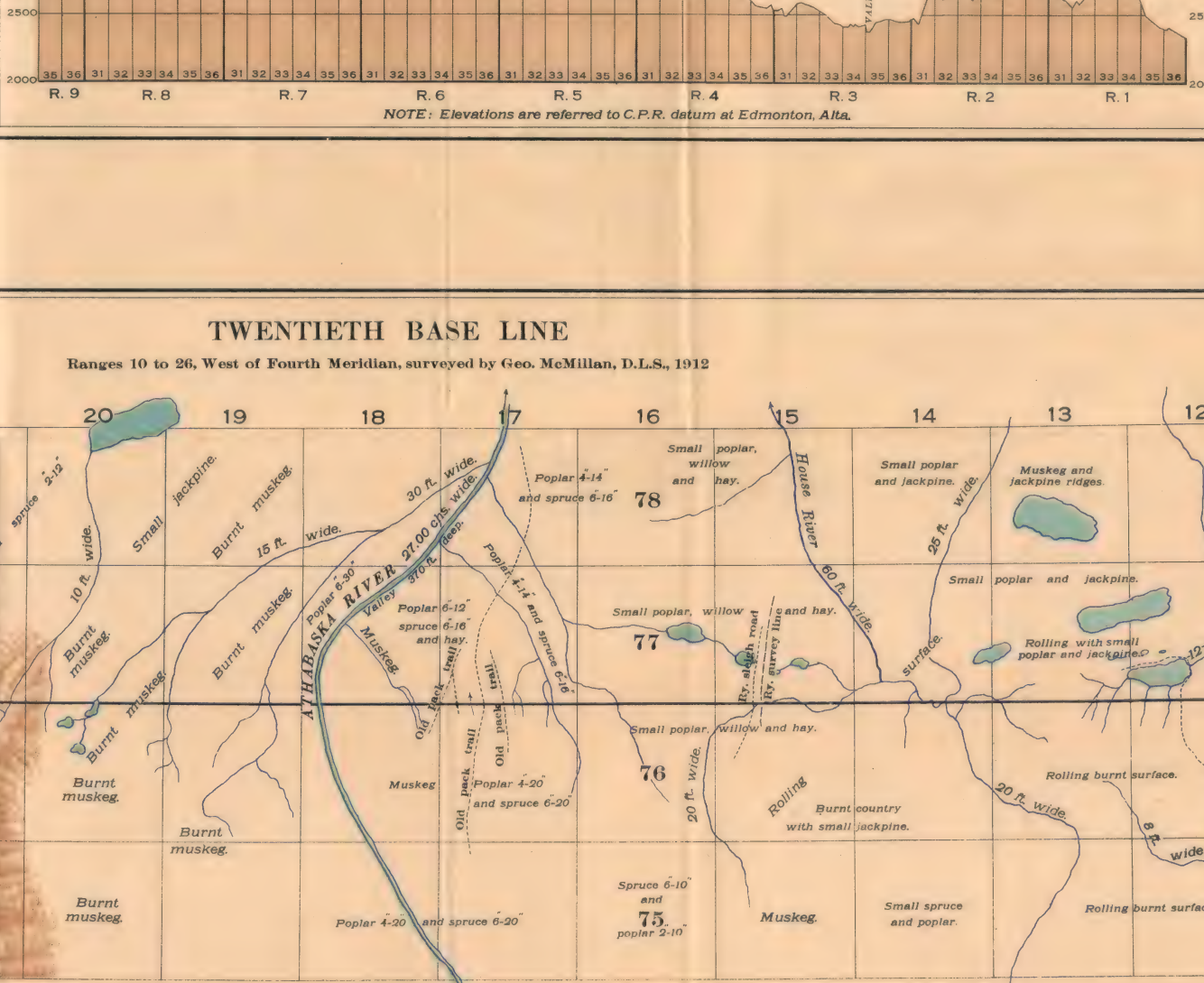


PROFILE

NOTE: Elevations are referred to C.P.R. datum at Edmonton, Alta.

TWENTIETH BASE LINE

Ranges 10 to 26, West of Fourth Meridian, surveyed by Geo. McMillan, D.L.S., 1912

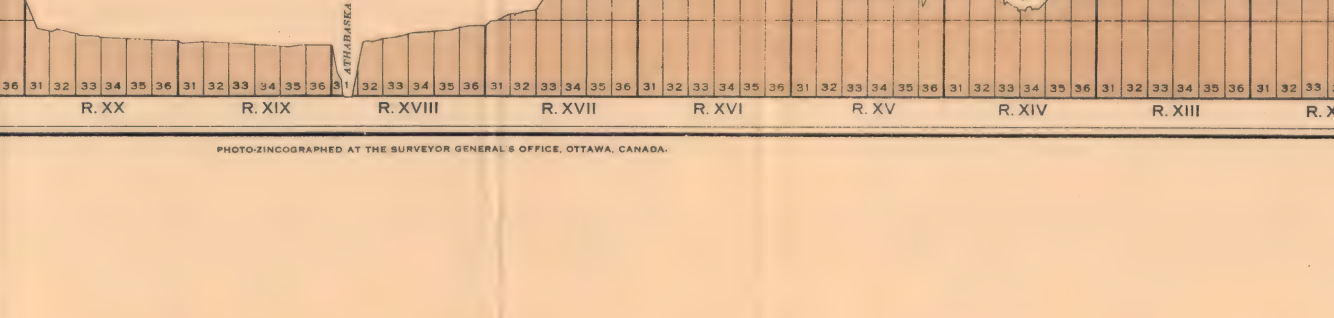


PROFILE

NOTE: Elevations are referred to sea level.

TWENTY-SECOND BASE LINE

Ranges 5 to 7, West of Sixth Meridian, surveyed by J. R. Akins, D.L.S., 1912



PROFILE

NOTE: Elevations are referred to C. P. R. datum at Edmonton.

PRINCIPAL MERIDIAN

Townships 61 to 72, surveyed by G. H. Herriot, D.L.S., 1912

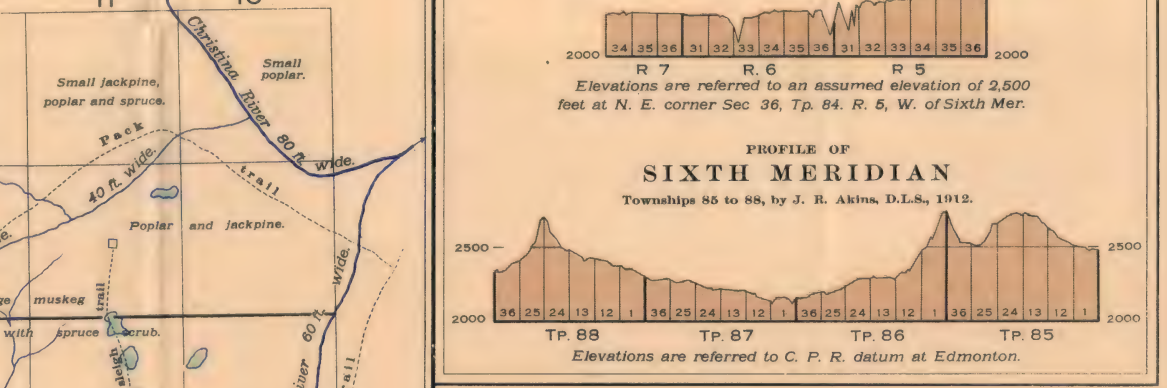


PROFILE

NOTE: Elevations are referred to an assumed elevation of 2,000 feet at N. E. corner Sec. 36, Tp. 80, R. 13, W. of Sixth Mer.

TWENTY-SECOND BASE LINE

Ranges 5 to 7, West of Sixth Meridian, surveyed by J. R. Akins, D.L.S., 1912

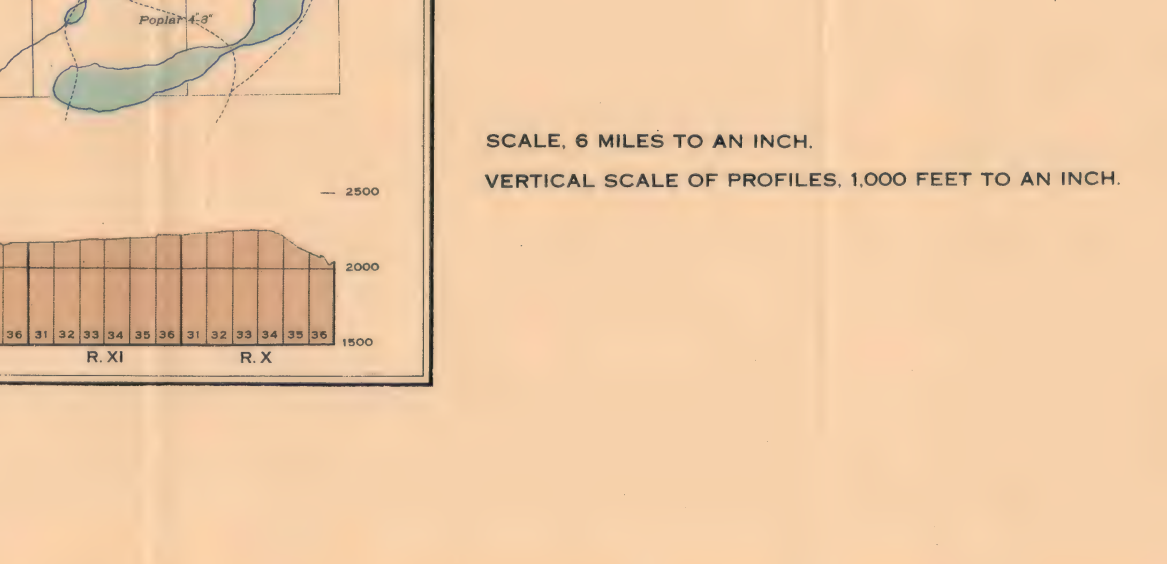


PROFILE

NOTE: Elevations are referred to C. P. R. datum at Edmonton.

SIXTH MERIDIAN

Townships 85 to 88, by J. R. Akins, D.L.S., 1912.



PROFILE

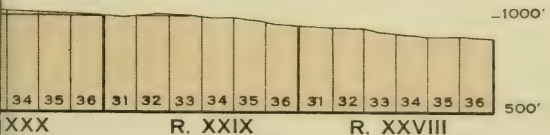
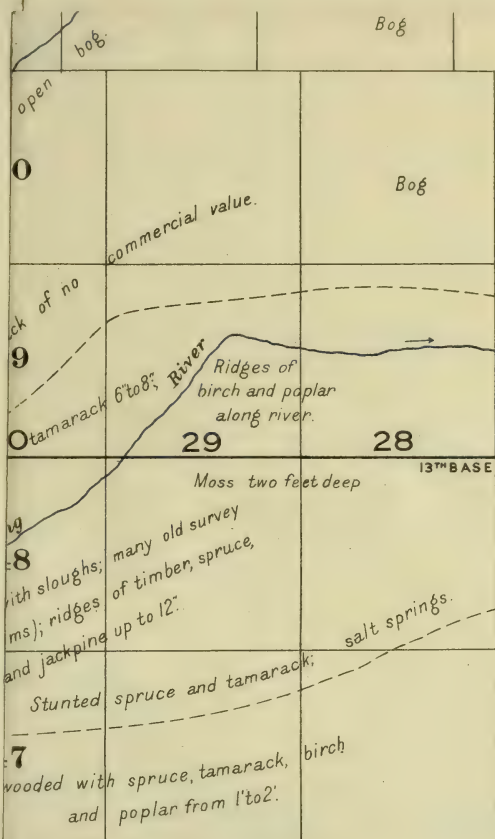
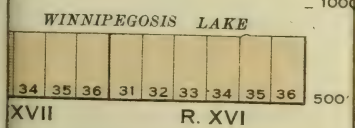
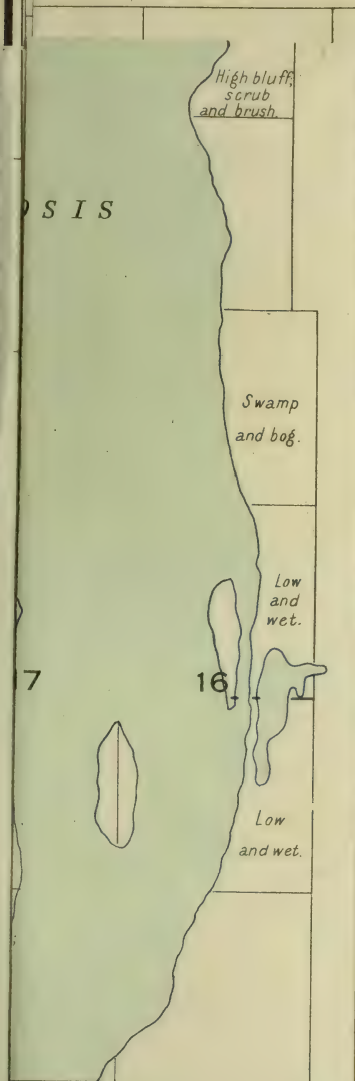
NOTE: Elevations are referred to C. P. R. datum at Edmonton.

SCALE, 6 MILES TO AN INCH.

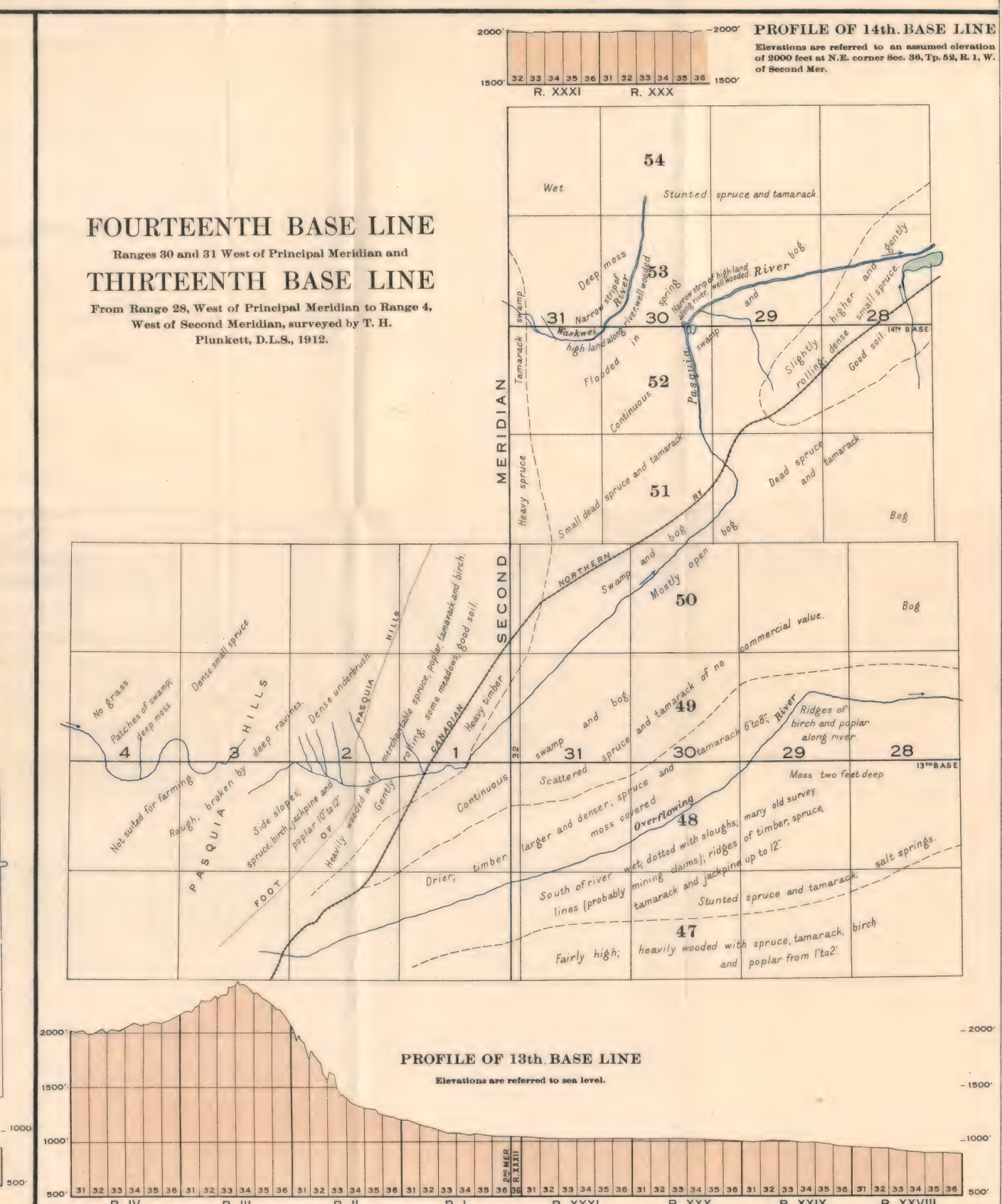
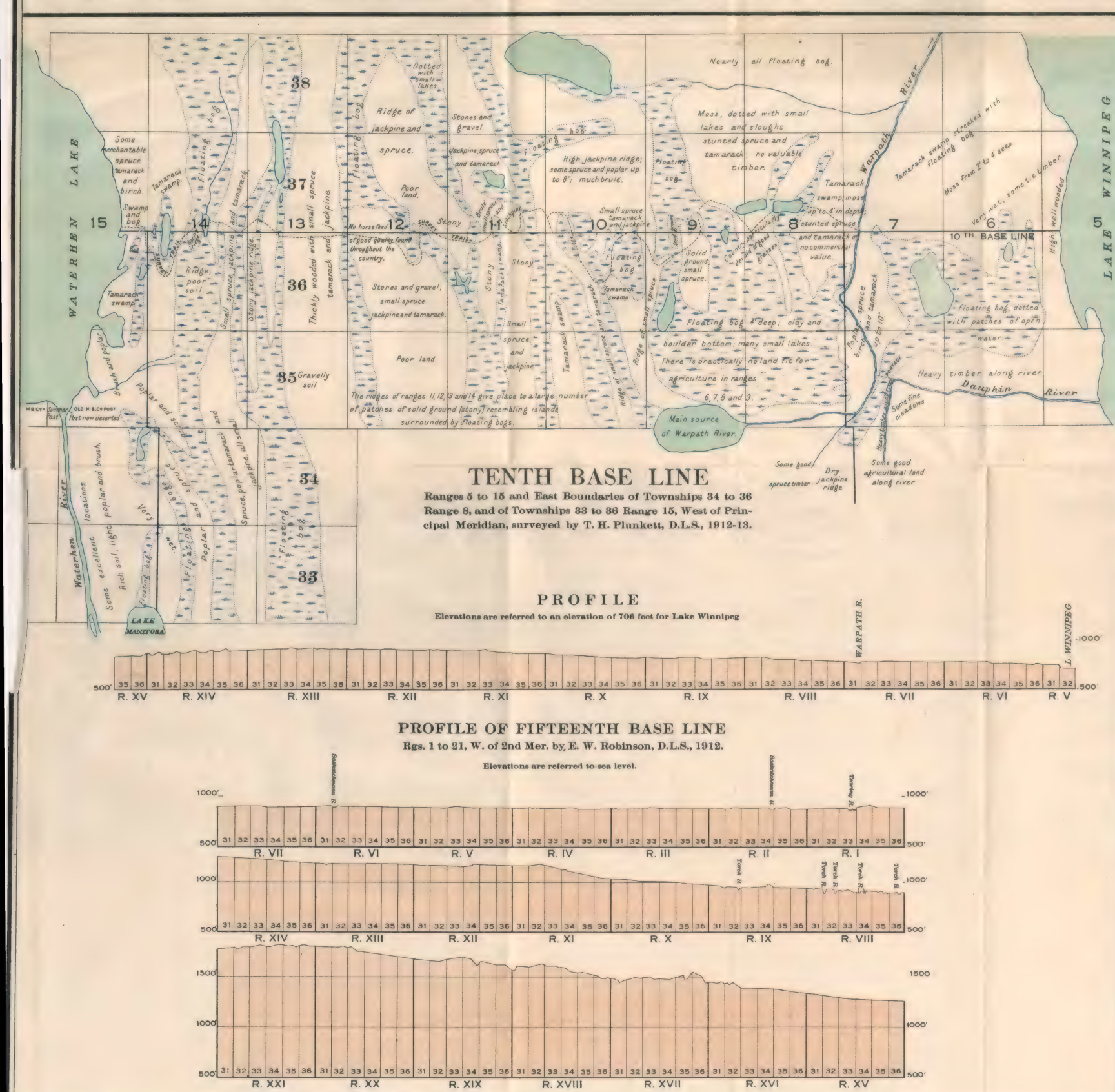
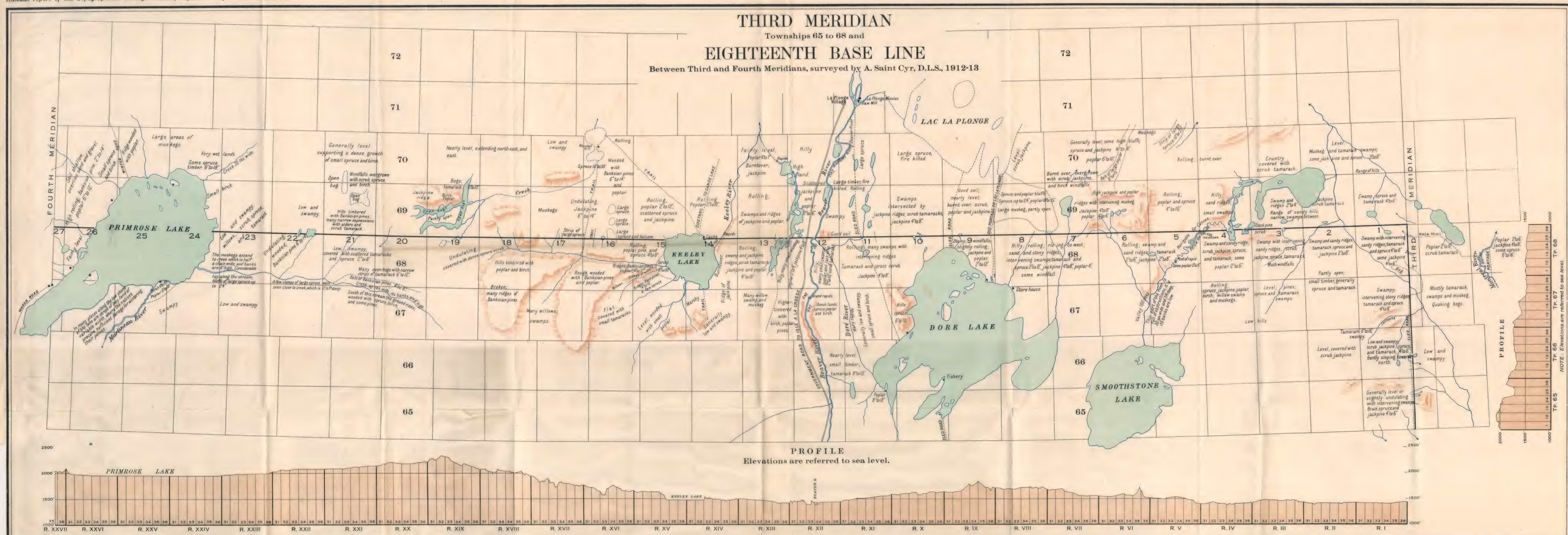
VERTICAL SCALE OF PROFILES, 1,000 FEET TO AN INCH.



A







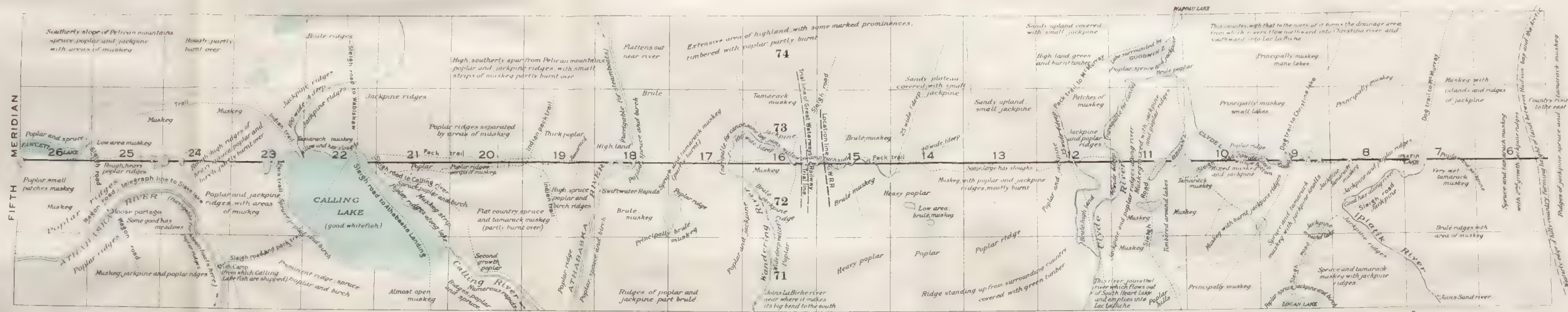






NINETEENTH BASE LINE

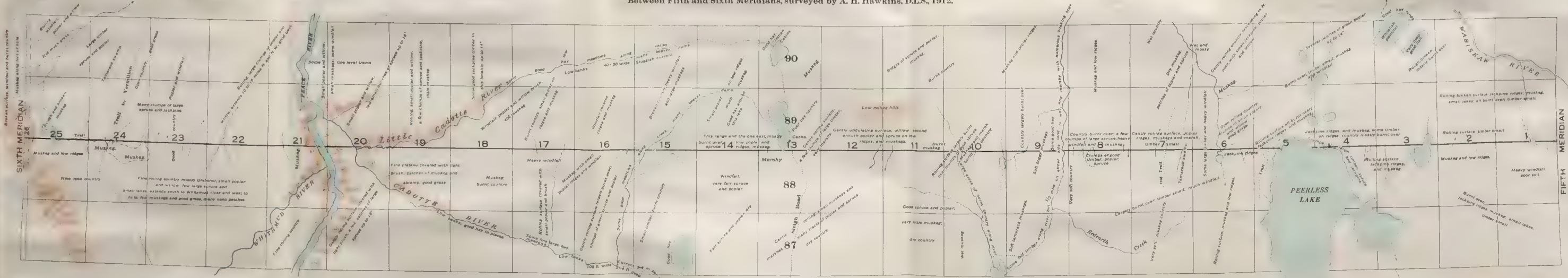
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PROFILE  
Elevations are referred to sea level.

TWENTY-THIRD BASE LINE

Between Fifth and Sixth Meridians, surveyed by A. H. Hawkins, D.L.S., 1912.



PROFILE  
Elevations are referred to C.P.R. datum at Edmonton.



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OF THE

TOPOGRAPHICAL SURVEYS  
BRANCH

1913-14

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OTTAWA

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# REPORT

OF THE

## SURVEYOR GENERAL OF DOMINION LANDS

### 1913-14

DEPARTMENT OF THE INTERIOR,

TOPOGRAPHICAL SURVEYS BRANCH,

OTTAWA, August 7, 1914.

The Deputy Minister of the Interior,  
Ottawa.

SIR,—I have the honour to submit the following report of the Topographical Surveys Branch for the year ended March 31, 1914.

The survey operations in the field were continued on about the same scale as during the previous year. The surveys carried out under the direction of this branch may be dealt with under the following heads: block outlines, township subdivision, inspection of contracts, delimitation of interprovincial boundary, levels, topographical work, stadia traverses, corrections and resurveys, settlement and townsite surveys, timber berth and mineral claim surveys, Yukon surveys.

#### BLOCK OUTLINES.

The unsurveyed portions of the provinces of Manitoba, Saskatchewan, and Alberta are wooded lands interspersed with extensive marshes, with here and there tracts of good land. Except along the main waterways and the surveyed lines of the Dominion lands system, this country is practically unknown. It is certain that much of the land is unsuitable for occupation, but with a view to the subdivision of the scattered tracts of good land as they are required for settlement, the efforts of the department have been directed towards the extension of the system of base lines and meridian outlines upon which the system of Dominion lands surveys is built up.

The tide of settlement in recent years has set strongly towards the Peace River district. Extending northerly from this district, the Peace and Athabaska rivers afford two natural highways along which the pioneers of future settlement will naturally proceed. There is already a persistent demand for surveys at Fort Vermilion and McMurray.

The meridian outline between ranges 17 and 18, west of the fifth meridian was surveyed northerly from the twenty-third base to the twenty-eighth base. From this meridian outline the intervening base lines were run across the valley of Peace river, thus enabling the department to proceed with the subdivision of lands along the valley as they are required.

Between the fourth and fifth meridians the twenty-fourth and twenty-fifth base lines were run westerly across the valley of the Athabaska. The survey of the twenty-first and twenty-second bases between these two meridians was also completed.

West of the Athabaska and south of McMurray the country is very wet, large muskegs extending back from the river as far as range 23. These muskegs as a rule can be easily drained, and when dry will make excellent agricultural lands. Extensive



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areas of good farming land lie along the valley of Wabiskaw river, which flows northerly in the vicinity of the fifth meridian, and empties into the Peace near Fort Vermilion. Fire has swept a great part of this north country, leaving only small patches of good timber here and there in the muskegs.

The district north of McMurray is not suited for farming on account of the muskegs and summer frosts, but ranching can be carried on successfully.

The sixteenth base line was run from the second to the third meridian, and the nineteenth base west of the third meridian across nineteen ranges. The production of these base lines was necessary to enable the department to subdivide lands to meet the needs of the scattered settlements in these districts. Exceptional difficulties were met with by the survey parties in both cases due to the extensive swamps encountered, and to the lack of horse feed along the base lines. The soil all through the country is good, but extensive drainage operations will have to be completed before much of the land can be used for agricultural purposes. Jackpine is the prevailing timber, but some areas of spruce up to thirty inches in diameter were seen.

The construction of the Hudson Bay railway, which is now under way, has created a demand for the survey of lands along the route. To meet this demand a network of base and meridian outlines had to be established north of lake Winnipeg.

The principal meridian was run north from the nineteenth to the twenty-first base line, and the twentieth and twenty-first base lines were run east a few ranges from the meridian, and the twentieth base line three ranges west of the meridian. The seventeenth, eighteenth, and nineteenth base lines were projected westerly from the principal meridian across the Hudson Bay railway, and the sixteenth base line was run from range 26, west of the principal meridian, to the second meridian.

The land along the principal meridian is mostly dry and rolling, and much of it is fit for agriculture. Along some of the lines surveyed, swamps prevail, the soil being mostly clay covered with moss. Timber as a rule is stunted, but occasional belts of jackpine and spruce up to twenty-six inches are found. Water-powers exist on all the streams, and fish abound in the lakes. Fishing will be a very profitable industry when the markets are made available by the completion of the railway.

The second meridian was extended northerly from township 78 to township 85. Little of the land along this part of the meridian is fit for agriculture, the soil being mostly sandy, with frequent outcroppings of rock. A few good areas, however, lie along Churchill river.

The proposal to extend a railway northerly between lakes Winnipeg and Winnipegosis towards Grand Rapids, and the demand for lands in the vicinity of this settlement, make it necessary to establish the base lines between the lakes. The thirteenth and fourteenth base lines were, last season, produced as far easterly as the shore of lake Winnipeg, and it is proposed to complete the survey of the remaining base lines the coming season.

#### TOWNSHIP SUBDIVISION.

Subdivision surveys were made under contract mostly in the Peace River district and between Athabaska (formerly Athabaska Landing) and Lesser Slave lake. The projection of railways throughout these districts has stimulated settlement, and extensive subdivision surveys were necessary to keep ahead of the demand for land.

The reports received from the surveyors indicate as a rule that these lands are good for agricultural purposes. They are mostly heavily timbered, but this will not greatly retard settlement, as all the prairie lands of Western Canada are already subdivided, and to a great extent alienated.

A number of townships were subdivided along Athabaska river north of Athabaska to meet the requirements of settlement extending northerly along the valley. A few townships north of Battleford, and a small number near lake Winnipegosis and east



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of lake Winnipeg were also surveyed. In all, twenty-seven parties were employed on contract subdivision. Subdivision surveys, of such a nature that they could not conveniently be executed under contract at the regular rates fixed by Order in Council, were made in the foot-hills of the Rocky mountains in southern Alberta. All the land lying east of the Rocky Mountains Forest reserve was also subdivided. These surveys were undertaken to meet the demand of farmers and ranchers for land in the foot-hills and in the valleys penetrating the mountains.

Several townships or portions of townships in the vicinity of Fort Vermilion were subdivided. Some excellent prairie land lies in that locality, and settlement there is rapidly increasing. Squatters had been on the land for years, and were urgently asking that the lands be subdivided so that their claims might receive consideration before the influx of settlers caused complications.

The country bordering the southern section of the Hudson Bay railway consists of narrow ridges separated by wide areas of swamp and muskeg, and is not suitable for subdivision in block. It is essential, however, that a few sections on each side of the right of way shall be laid out, and during the past season, the work was carried on as far north as the sixteenth base line. A number of unsurveyed fractional townships around the Porcupine Forest reserve were also completed.

In the railway belt, British Columbia, seven parties were employed on township subdivision. The work was mostly in compliance with the demands of the Dominion lands agents and the settlers. Lands along the right of way of the Canadian Northern and Canadian Pacific railways were subdivided. Township subdivision in British Columbia includes in many cases, the survey of timber berths, village and town lots, and the retracement of Indian reserves and provincial lot boundaries. Owing to the mountainous character of the country the surveys are not suitable for execution under contract. In the Revelstoke and New Westminster districts, land is so valuable that it is usually allotted to settlers in 40-acre parcels. To mark the boundaries of such parcels sufficiently involves several miles of additional survey in each township. Land along the Fraser is excellent for fruit farming, and this industry is making rapid strides, though the lack of transportation is a great drawback.

By an Act of the Legislature of British Columbia, passed in 1883, the province granted the Dominion three and one-half million acres of land lying east of the Rocky mountains and adjoining the Northwest Territories. The boundaries of the block were surveyed a few years ago. On account of the excellent land in the block and the prospect of railway construction across it in the near future, settlers are flocking to the district. To meet the requirements of the newcomers, subdivision surveys are required of the prairie openings here and there. Several hundred quarter-sections were surveyed last season, and the fact that lands are available in that fertile district will no doubt stimulate settlement.

## INSPECTION OF CONTRACT SURVEYS.

Subdivision surveys performed under contract during the year were examined by five inspectors. Their reports indicate that contractors have generally performed their surveys in fair conformity with the provisions of the Manual of Survey, and of their contracts with the department.

## INTERPROVINCIAL BOUNDARY SURVEYS.

The boundary between the provinces of British Columbia and Alberta follows the Rocky mountains from the international boundary to the 120th meridian; thence it runs due north along this meridian to the 60th parallel of latitude.

At the request of the province of British Columbia arrangements were made for the delimitation of this boundary as a joint survey under Mr. A. O. Wheeler, B.C.L.S., Mr. R. W. Cautley, A.L.S., and Mr. J. N. Wallace, D.L.S., representing the provinces of



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British Columbia and Alberta, and the Dominion, respectively. The survey was begun last year in the vicinity of the main passes. The line was established and marked across Kicking Horse pass, Vermilion pass, Simpson pass, and Crowsnest pass. Pyramids of concrete, two feet high and covered by galvanized iron, were erected to mark the boundary where surveyed. Above timber-line, stone cairns five to seven feet high were substituted for the cement pyramids.

#### LEVELS.

Five thousand three hundred miles of line have now been levelled by surveyors of meridian outlines and base lines in the western provinces. As a result, much information previously lacking is now available for dealing with future extensions of railways, utilization of water-powers, improvement of navigable rivers, drainage, and development of natural resources. The results show that many areas of wet land, reputed to be of little value, can be drained readily into neighbouring streams, and become fit for agriculture. These lines of levels, having been commenced in unsettled lands where no altitudes were previously known, are dependent on the running of other lines for their connection to sea-level, and to one another. Twelve hundred miles of these connecting lines have already been run. These have joined the greater part of the levels to sea-level, thus improving their accuracy, and have furnished new information for the partly settled lands. The results are now being tabulated and will be published shortly.

#### TOPOGRAPHICAL SURVEYS.

At the request of the Director of Forestry, a topographical survey of the Crowsnest Forest reserve on the eastern slope of the Rocky mountains was begun last season. It is expected that the map of the reserve, when published, and the data collected by the survey, will be of great benefit, not only to the Forestry Branch, but also to the numerous holders of oil, coal, timber, and mineral claims.

In 1886 and 1888 a topographical survey was made of the country in the vicinity of Banff, Alberta. A scheme of lots was prepared in conformity with the topography, but only a few of the corners were marked. Mr. Mawson, an expert on town planning, has been engaged on the amended scheme for the subdivision. The villa-lot section and the townsite at Banff have been retraced. Roads have also been located, and scattered surveys made throughout the Rocky Mountains park.

In 1913 part of the townsite of Jasper in Jasper park was surveyed. A topographical survey of the surrounding country was commenced in order to obtain information for the preparation of a suitable scheme for the development of the park. The work is being continued this year.

#### STADIA SURVEYS.

Eight parties were employed in the prairie regions on stadia surveys of lakes and ponds that have been gradually drying up, and of rivers that have changed their courses. These surveys were undertaken for the purpose of amending the official plans of the townships so that they may represent all lakes, ponds, and rivers as they are at the present date, and give the correct area of land available.

A party on stadia surveys consists of a Dominion Land surveyor in charge, a surveyor's pupil, two rodmen, and a cook. A district is assigned to each party, and they are expected to investigate and report upon all bodies of water over five acres in extent in each township in which they carry on operations. If a body of water is over five feet deep, or if it does not dry up in the fall, the banks are traversed and a plot thereof forwarded to the head office. Rivers over a chain wide, and all islands, are accurately surveyed.

To avoid delay in issuing amended official plans, the surveyor is required to plot his traverse in camp and send it to the head office at the earliest opportunity. The sur-



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Surveyor is provided with special field books suitable for field notes of stadia surveys, and with convenient portfolios containing paper and drawing board for making traverse plots. Complete detailed instructions for making stadia surveys, for keeping field notes, and for preparing plots have been printed and furnished to each surveyor.

The eight parties employed last season made traverses or investigations in 442 townships; 3,360 miles of traverse were run.

## CORRECTION AND RESURVEYS.

Some of the early surveys in the western provinces were badly executed; lines which are shown on the official plans as running north and south or east and west are found to be very much out in direction, and quarter-sections returned as 160 acres each are sometimes more than 40 acres over or under the area returned by the surveyor. When authorized by the provisions of the Dominion Lands Surveys Act, corrections are made by our surveyors. Last year two surveyors were employed to travel from place to place to make corrections or such small original surveys as could be done by a surveyor and assistant without a party. They made surveys in about seventy townships.

In many townships surveyed twenty-five or thirty years ago not a trace can be found of the original survey. Where the marks have disappeared it is difficult for newcomers to locate the lands. It is the policy of the department to renew the lines in townships now being colonized after an investigation has shown that it is impossible to locate the lands without a new survey. Three parties were employed on resurvey work during the past season.

Base lines and initial meridians run many years ago are also found to have been badly surveyed. These lines being the governing lines of the Dominion lands system it is very necessary that their survey be accurate and reliable. To determine the nature and extent of some of the discrepancies, the retracement of the old base lines and meridians was commenced in 1912. In 1913 the second base line was retraced from the principal to the second meridian, as well as other lines in Manitoba and Saskatchewan. In 450 miles of line retraced the five largest errors found were of twenty-seven chains, seventeen chains, eight chains and eleven chains. The error of twenty-seven chains was made in measuring distance, but the remaining four were errors in direction.

## SETTLEMENT AND TOWNSITE SURVEYS.

In the summers of 1911 and 1912 a survey party was engaged in surveying settlements along the Athabaska and Slave rivers. The work was continued during 1913, and the surveyor in charge will remain in the field till the autumn of 1914. It is expected that the survey of all the settlements along these rivers will be finished by that time.

A settlement was also surveyed at Wabiskaw, Alberta, and a summer resort at Wymark, Saskatchewan.

## TIMBER BERTHS.

Under the present regulations the surveys of timber berths are made by the department before the berths are offered for sale. The cost of the surveys is included in the upset prices of the berths. The berths are surveyed by surveyors working under contract, or by the surveyors employed regularly during the season under daily pay, as may seem most economical. Fifty-two miles of timber berth boundaries were surveyed in 1913.

## MINERAL CLAIMS.

Every mineral claim is designated by a lot number in the group to which such lot belongs. The claimant, after staking his claim, is required to apply to the Surveyor General to have instructions issued to a Dominion land surveyor to have the boundaries of the claim run out, measured, and marked on the ground. Lot and group numbers



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for the claim are furnished the surveyor with the instructions for survey. After completing the work on the ground, the surveyor must forward to the Surveyor General a plan of the claim on tracing linen, accompanied by complete field notes. He must furnish as well the necessary duplicates, the plan for filing with the mining recorder and for posting on the claim.

Twenty-two mineral claims outside of the Yukon Territory were surveyed last season. Thirty-one additional were surveyed in the Yukon Territory. In the latter district the group and lot numbers are furnished to the surveyor by the Commissioner of the Yukon, and the returns of the survey must be filed with the commissioner.

## YUKON SURVEYS.

Dominion land surveys in the Yukon Territory are under the direction of a Director of Surveys who has his office at Dawson; he has a staff of two draughtsmen. The work is mostly in connection with mining claims.

During the year 167 miles of base lines and connecting traverses were made along The work is mostly in connection with mining claims.

## STATEMENT OF MILEAGE SURVEYED.

The following is a comparison of the mileage surveyed each year since 1911:—

Nature of Survey.	April 1, 1911, to March 31, 1912.	April 1, 1912, to March 31, 1913.	April 1, 1913, to March 31, 1914.
	Miles.	Miles.	Miles.
Township outlines.....	2,041	2,718	3,760
Section lines.....	10,098	10,365	7,918
Traverse.....	2,577	3,509	5,748
Resurvey.....	2,317	2,586	1,632
Total for season.....	17,033	19,178	19,058
Number of parties.....	61	72	66
Average miles per party.....	280	266	289

The following tables show the mileage surveyed by the parties under daily pay and by the parties under contract:—

## WORK OF PARTIES UNDER DAILY PAY.

Nature of Survey.	April 1, 1911, to March 31, 1912.	April 1, 1912, to March 31, 1913.	April 1, 1913, to March 31, 1914.
	Miles.	Miles.	Miles.
Township outlines.....	992	1,619	2,074
Section lines.....	823	1,358	1,695
Traverse.....	498	992	4,179
Resurvey.....	2,287	2,538	1,613
Total for season.....	4,550	6,507	9,561
Number of parties.....	29	35	39
Average miles per party.....	157	186	245



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## WORK OF PARTIES UNDER CONTRACT.

Nature of Survey.	April 1, 1911, to March 31, 1912.	April 1, 1912, to March 31, 1913.	April 1, 1913, to March 31, 1914.
	Miles.	Miles.	Miles.
Township outlines.....	1,049	1,099	1,695
Section lines.....	9,275	9,077	6,214
Traverse.....	2,079	2,517	1,569
Resurvey.....	80	48	19
Total for season.....	12,483	12,671	9,497
Number of parties.....	32	37	27
Average miles per party.....	399	342	352

Owing to the nature of their work, twelve parties are not included in the statement of mileage for the year ended March 31, 1914.

## COST OF SURVEYS.

The following statement shows the average cost per mile of surveys executed by surveyors under daily pay, and by surveyors under contract:—

	Surveyed under daily pay.	Surveyed under contract.
Total mileage surveyed.....	9,561	9,497
Total cost.....	\$542,297	\$278,797
Average cost per mile.....	\$56.72	\$29.35

## CONTRACT SURVEYS.

Section 53 of the Dominion Lands Surveys Act provides that the township subdivision survey of Dominion lands shall be performed under contract, either at a rate per township, per mile, or per acre, to be fixed, from time to time, by the Governor in Council, or by competitive tender, as the Governor may, from time to time, direct; provided that in special cases, where circumstances render it advisable, the Governor in Council may order the survey of a township or townships to be otherwise performed.

In my opinion the time has come to abandon the system of contract surveys and to have the subdivision surveys of the Dominion executed by surveyors and parties paid by the day.

The system of Dominion land surveys is an adaptation of the United States system. The method of surveying under contract was one of the features borrowed from the United States; it had several advantages and as land had little value, it was believed that the imperfection of the surveys was of small consequence. The system was cheap and, as little or no inspection was made, it gave no trouble for the time being. Surveyors were ready to undertake surveys for almost any remuneration. At one time, tenders were called; the rates asked by the surveyors were so absurdly



low that they have since been fixed by Order in Council at a figure sufficient for doing the work irrespective of what the surveyors would be ready to accept. A consideration which had great weight when a rush of immigration set in was that the amount of surveying which could be performed under the contract system was unlimited. With work paid by the day, the amount was limited by the number of qualified surveyors available; there was no such limitation with contractors.

The objections to surveys made under contract are many. The cost of a subdivision survey cannot be estimated in advance; it depends upon the nature of the ground and upon other circumstances unknown both to the Government and to the contractor, and which cannot be foreseen. No schedule of rates can be devised which will afford fair remuneration to the contractor in all cases without being excessive in any case. A contractor may make large profits if he happens to strike good country and is favoured by circumstances, while another may lose money through no fault of his own, if circumstances are against him. If he is unable to pay the wages of his men or his bills for supplies, the creditors ask payment from the Government and are aggrieved when it is refused.

Before a contractor is paid for a survey, some one should go over the lines in order to make sure that the survey for which payment is asked has actually been made. This inspection is never made for the obvious reason that it costs as much to inspect a survey line as to survey it in the first instance, the inspection involving the same measurements as the survey itself. If all the lines were inspected, the inspector might as well survey them himself and dispense with the survey of the contractor, thus saving the cost of the contract.

In the early days, very little inspection was made; the word of the contractor that the survey had been correctly executed was accepted and he was paid. We are now going over these old surveys; many of them are incorrect. Sometimes we can find no trace of a survey, and it is a question whether the original survey, which was paid for, was ever made.

At present, an inspection is made of a few miles in each contract. If nothing wrong is found, it is assumed that the remainder of the contract has been executed and that the survey is correct, but there is no direct evidence that such is the case.

There are five inspectors and a chief inspector of surveys; the cost of inspection is over \$68,000 a year. The expenditure on contract surveys during the year was about \$240,000, so that the inspection costs more than one-quarter of the work inspected. It is true that the inspectors do some little work besides inspection, but it does not amount to much.

Some surveyors do good work under contract; others do not. When a contractor's work is found defective, he is invited to correct it. He corrects the defects pointed out by the inspector, after which a new inspection is made and new defects are discovered. This may happen again and again, until so many inspections are made that it would have been cheaper for the inspector to make a new survey.

When the survey is very bad, the situation is most embarrassing. The bond given by private sureties for securing the advances does not appear to have much value; we have lost the cases that were brought before the courts. Surety companies are the only ones from whom we have recovered because they prefer paying to being sued by the Government. Practically we have the alternative of accepting bad work or losing our advances.

A large proportion of the appropriation for Dominion land surveys is now being expended in resurveying townships imperfectly subdivided under contract. The lands being settled and occupied, the resurveys are very intricate, unsatisfactory to the settlers, and most expensive. Money would have been saved if the surveys had been properly made in the first instance. For this reason alone, if for no other, the contract system should be abolished.



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Land has become too valuable for the imperfections of the contract system. The value of one or two acres in a quarter-section represents many times the difference in cost between a good and a bad survey.

After he has finished the survey in the field and received 75 per cent of the amount of the contract, the contractor attends to the preparation and correction of his field notes when he is not otherwise engaged. This is the cause of serious delays; it is seldom less than two years before the township plans are issued and the lands thrown open to settlers.

With competent surveyors and properly organized parties, there is no reason why subdivision surveys paid for by the day should cost much more than if executed under contract. The contract system was discarded in 1910 by the United States. The report of the Commissioner of the General Land Office for 1911 contains the following remarks:—

“June 30, 1911, was the close of the first fiscal year under the direct system, and it is gratifying to be able to report that it has been an unqualified success. When the change in method from the contract to the direct system was first considered, it was expected that the cost of production would not be greater than that in the procedure which it was proposed to abandon. It was conceded that greater expedition would ensue and better work be accomplished, and this alone would have justified the change. The work of last season and this season, however, has shown that the average cost of survey of a township under the direct system is \$750, or a saving of about \$5 per mile, the average cost of surveys under the contract system being \$15 per mile.

“There is, in addition, a saving from one to two years in time, counting from the time of the appropriation to the completion and adoption of the survey.”

Again in his report for 1913, he states:—

“The third season of field operations under the direct system has fully demonstrated the wisdom of abandoning the contract system.”

## BOUNDARY MONUMENTS.

The corner of a section or quarter-section is marked by an iron post and four pits, with or without a mound. The mound and pits become obliterated in time, or are wilfully destroyed; the post, which is a 3-foot length of half-inch iron pipe, is easily pulled out. A person who has an interest, for some purpose of his own, in removing land marks, can easily do it, and evidence is not lacking of the destruction of a large number of survey monuments. When the monuments are gone, a new survey must be made and, if the land is alienated, it is a most unsatisfactory and expensive undertaking.

A more substantial boundary post, and one that cannot be so easily removed is very desirable, but the improvement will involve some expense. Not only will the initial cost of the post be greater, but the post will be heavier, and transportation will be expensive. Land has become so valuable and the troubles due to lost corners are so far reaching that the outlay for improving corner marks will prove a wise investment.

## CORRESPONDENCE.

The correspondence consisted of: letters received, 13,588; letters sent, 17,000.

## ACCOUNTS.

Number of accounts dealt with, 1,616; amount of accounts, \$1,073,655; number of cheques forwarded, 3,651.



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## OFFICE WORK.

*T. Shanks, Assistant Surveyor General.*

In previous reports, attention was called to the deplorable condition of the office staff. The situation has not improved; on the contrary, it is becoming worse. Last year twelve permanent technical employees left our service; their names are: J. P. Cordukes, A. S. Thomas, L. O. R. Dozois, G. O. Vogan, T. S. Mills, S. D. Robinson, Jas. Hill, G. N. Clarke, O. E. Fournier, J. J. Freeland, J. A. S. King, L. G. Smith.

Twenty temporary employees were secured through the Civil Service Commission for filling the vacancies. Of these ten left before their period of probation had expired, and before we had a chance of appointing them permanent; their names are: W. B. George, G. B. Stewart, A. H. Bick, L. C. Prittie, G. A. George, J. Mooney, A. J. Boucher, L. Leclerc, H. S. Van Patter, R. J. Gauley.

Comments are superfluous. Employees do not abandon their positions in such large numbers unless there is something radically wrong in the conditions of their employment. This has been going on for years. The disastrous consequences of this policy are set forth in last year's report; I can only repeat that efficient administration with a staff continually changing is not to be thought of.

As an office, our first duty is towards the settler on Dominion lands. It is important that his homestead shall be correctly laid out and marked by proper monuments. While the subdivision of Dominion lands appears to be an operation of extreme simplicity, actual experience has proved that it can be done only by properly qualified men equipped with instruments specially designed for accurate work. Facilities have now been provided in one of the divisions of the office for instruction in special astronomical work, and for the testing and inspection of surveyors' instruments. The results have amply justified the additional attention given to this department of our work.

The preparation of detailed instructions, many of technical nature, covering the work of a field staff of seventy or eighty surveyors, requires the services of men who are thoroughly conversant with survey methods, and with the history and records of the old surveys. Unfortunately, few of our staff have been in the service long enough to acquire these qualifications.

Experience has shown that better results have been obtained by a separation of the draughting offices from the other technical work of the branch. The number of properly qualified draughtsmen looking for positions is very small, and there is great difficulty in getting competent men for the salaries offered. Many of the best technical men are poor draughtsmen and, on the other hand, very few of the expert draughtsmen are qualified for the examination of survey returns, the checking of astronomical data, and the compilation of topographical and geographical information. It has proved a decided advantage to have the compilation of maps and plans prepared by men possessing technical qualifications for the purpose, and to have the draughting done by others specially trained for that work.

It is desirable that the surveys shall be confirmed, and the plans thereof issued as soon as possible after the field work is completed. Delays lead to misunderstandings between the settler and the department, and it is frequently a matter of surprise to the former that it is not possible for him to secure patent as soon as the lines are marked on the ground. Where the matter is particularly urgent the surveyor is instructed to forward returns from the field as soon as the survey is completed, but this can be done in comparatively few cases without seriously interfering with the field work. The cost of a party in the field is so great that it is not advisable to keep the surveyor employed on clerical work which, under ordinary circumstances, can be much better done in an office where there are proper conveniences for the purpose, and without keeping the party idle.



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Inquiries from the general public for information as to the localities covered by subdivision or exploration surveys are being received in increased numbers. An attempt is made to print the surveyors' descriptive reports as soon as possible after they are received. The results are not entirely satisfactory as the subdivision reports are not forwarded by the surveyor until the season's work is completed, and the delays in compilation and printing are sufficient to considerably impair the freshness and value of the reports when issued. Little has been done to prepare for publication the reports covering the districts into which subdivision has not been extended, although in many cases these localities have been fairly well covered by the explorers who are now attached to block outline parties. The sketch maps showing the exploration and the general report of the surveyor in charge of the party are published in the annual report of the branch. This information, however, is not in convenient form for reference, as it can be obtained for any particular district only by searching the reports for several years. With additional office help it should be possible to compile much valuable information in such a form as to be of the greatest value to the public. A start has been made in this respect by issuing a pamphlet covering the Peace River district. The demand for this publication indicates the need for further work along the same lines.

## DIVISION OF SURVEY INSTRUCTIONS AND GENERAL INFORMATION.

(*H. G. Barber, Chief of Division.*)

The work of this division consists, in general, of the preparation of instructions for the surveyors who are engaged in the field operations, the entering of all survey returns in the various registers, the issuing of all preliminary plans except for the townships in the railway belt of British Columbia, the compilation of the annual report of the branch, and the answering of requests for information received from the general public and from other branches and departments.

During the year the total number of draft letters and memoranda was 8,293, an increase of more than 30 per cent over the preceding year.

Two hundred and ninety-five drafts of instructions to surveyors for the execution of surveys were issued, involving the preparation of 2,628 sketches and 234 maps and tracings.

Two thousand and seventy-eight communications from settlers and others, and inquiries from other branches and departments were dealt with, an increase of more than 40 per cent over the number during the preceding year. This necessitated the preparation of 588 sketches, 92 maps and plans, and 386 pages of field notes. Three thousand one hundred and sixty-one sketches were also made for the information of other branches.

Twelve descriptions of parcels of land were drafted, and a number were checked and revised for other branches.

Preliminary plans were issued for 316 townships. These plans allow of the land being opened for entry at once without waiting for the final examination of the surveyors' returns and the issue of the official plans.

Plans of 672 townships and of thirteen townsites or settlements were received from the lithographic office, entered in the various registers and distributed. One hundred and eight sectional maps and 151 miscellaneous plans were also received and distributed.

During the year there were received from the surveyors in the field, and entered in the office registers, 1,304 progress sketches, 368 books of field notes for township surveys, 414 books and 762 plans for miscellaneous surveys, 219 timber reports, 107 statutory declarations, and returns for 125 magnetic observations, 90 azimuth observations, and for 11 timber berths. General reports on their survey operations were received from all the surveyors under daily pay.



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Their examination having been completed, 456 field books of township surveys and 93 books and 105 plans of miscellaneous surveys were placed on record.

For reference in the work of the office, there were received from the Survey Records Branch, 5,480 field books and 630 plans, and from the Registration Branch, 1,734 files.

Two new publications were issued, namely, the new edition of the Manual of Instructions for the survey of Dominion Lands, and the second edition of the pamphlet entitled "Description of the surveyed townships in the Peace River district in the provinces of Alberta and British Columbia." Already nearly two thousand of the latter publication have been distributed.

A new kind of work was commenced in 1911-12 in the preparation of topographical maps of Banff, Woodhaven, and Jasper (Fitzhugh) townsites, and of Bankhead cemetery, on which schemes of subdivision were laid down, and from which working plans for the surveyors were prepared. This work was continued during the year just passed and, in addition, similar maps and plans were prepared for summer resorts in Madge, Clear, and Elk lakes. A new and comprehensive scheme of subdivision for Banff and its vicinity is now under consideration.

#### DIVISION OF EXAMINATION OF SURVEYS.

*(T. S. Nash, Chief of Division.)*

The work of this division comprises the returns of survey of all Dominion lands other than those in the railway belt in British Columbia.

The first returns received from the surveyor are sketches showing the progress of his work. These sketches are examined to see that correct methods are being employed and that satisfactory results are being obtained, 304 progress sketches from contractors, 533 from men employed by the day, and 149 from inspectors of contract surveys were examined, making a total of 986 sketches.

Following the change in the method of dealing with water areas in the prairie provinces, outlined in the last annual report, eight surveyors were employed during this year in the investigation and retraverse of lakes and former lake-beds. This retraverse of lakes by stadia added materially to the work of this division. As this branch of work was new, and the instructions to surveyors were of a tentative nature, it was necessary to examine the returns of survey as soon as received with a view to the revision of the instructions in order to get the most desirable results. As the examination progressed, a comparative analysis of the results was made in order to arrive at a working basis for showing the new land areas and water areas on township plans. One hundred and thirteen field books and 789 plots comprised the final returns of survey of the lakes in 458 townships. The examination of these, together with the preparation of the new township plans, involved so much additional work that it was necessary to employ six of the stadia surveyors after quitting the field.

Including these stadia surveys, examination has been made of 704 subdivision surveys, 95 miscellaneous, and 243 township outlines. Four hundred and three memoranda on examination of survey returns were sent to surveyors and 407 replies were received and the necessary corrections made. Compiled plans of 549 townships were completed, of which 241 were first editions. Compiled plans of thirty-six miscellaneous surveys, twelve settlements and six timber berths were also completed. The number of draft letters prepared was 1,850. Forty-three accounts for contract surveys were prepared and closed, as the work was shown by the inspectors' reports to be satisfactorily performed.

The new plan of the town of Banff was completed, and considerable time was spent on the compilation of surveys in the adjoining villa-lot district.



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With regard to the maps of the Yukon Territory, one sheet has been completed, and ten are practically finished, having been held up awaiting a further tie between existing surveys. These latter sheets are south of Dawson in the vicinity of the Yukon and Stewart rivers. Twenty group lot surveys, twenty-four base lines and reference traverses in various parts of the territory, and a triangulation survey of part of the lower watershed of Klondike river were received and examined.

Requests for information from other branches of the department involved the writing of 145 memoranda, the preparation of sixty-one sketches and the calculation of 394 areas. The field notes were examined and plans prepared for six timber berths comprising fifteen blocks whose boundaries totalled 140 miles of survey and whose area was approximately 54 square miles. The returns of eighteen other timber berths were examined. The plans of road diversions submitted by the Provincial Governments have been examined to the number of 405. Regarding railways, 110 plans of right of way were examined, the mileage of which was 1,917. As many of these plans were in duplicate or triplicate, the gross mileage of plans examined was equivalent to 4,584. The final returns of twenty-six mineral claims outside of the Yukon Territory were received and examined.

## DRAFTING AND PRINTING DIVISION.

(C. Engler, *Chief of Division.*)

*Township Plans.*

The preparation of township plans for printing is the most important work of this division. The issue of the preliminary plan of a township allows settlers to initiate proceedings towards obtaining title to their lands, but the title cannot be obtained until the issue of the official plan. It follows that the full value of surveys has not been obtained until such plans have been issued and, consequently, any delay in the issue of the official plan is equivalent to holding back the results and benefits of the survey. It is therefore essential that plans be issued as promptly as possible, and although the work on such plans has become more or less of a routine character, it is to be remembered that they constitute the most important part of our work even though other work may be more inviting and attractive.

The number of township plans prepared for printing was 724. The work on plans of second or subsequent editions is becoming in some respects simpler, in others more complex. As all areas of patented lands are now omitted, the plans have fewer areas, but the notes affecting the plan are more complex.

*Plans of Settlements, Townsites, Subdivision and Miscellaneous Surveys.*

The number of such plans was seventy. These plans vary in size and scale and, as a rule, require more time to prepare than township plans. In designing them the size, scale, and the arrangement of the notes, north point, border, and margin are subject to the following considerations:—

1. The scale must conform to the requirements of the Manual of Surveys.
2. No sheet can be fed into our lithographic presses larger than  $25\frac{1}{2}$  inches by  $36\frac{1}{2}$  inches.
3. The top of the plan should be to the north if possible.
4. To prevent waste of paper, plans must, as far as possible, be adapted to the sizes of lithographic paper kept in stock.
5. The arrangement of the borders, notes, etc., of a plan must be such as to reduce to a minimum the number of negatives necessary to reproduce it.



The first and second of the above considerations are absolute, i.e., the scale of a plan cannot vary beyond certain fixed limits, and the size of the sheet of paper is limited. It follows that when a plan covers a very large area it must be printed in sections and, if necessary, joined afterwards. When plans are to be reduced by photography, the amount of such reduction must also be kept in mind by the draughtsman. On a plan too much reduced, letters and figures become so small as to be illegible, and fine lines become so thin as to be almost indiscernible. To offset this the draughtsman must make his letters and figures large enough and his lines heavy enough so that the reduction will make them just right.

It will be seen from the above that when a plan is to be copied for photographing and printing the proposition confronting the draughtsman is not simply that of making a neat copy. He must do this, of course, but at the same time he must keep in mind the processes and operations through which the plan must subsequently pass, in order to save extra labour and expense in these operations, and to give the best result when printed. This is especially true of plans in several colours.

#### *Plans to accompany Orders in Council.*

These plans are usually small and in several colors. As the Orders in Council are bound in a volume eight inches by thirteen inches the plans are printed on paper of this size, if possible. In copying them, care is taken to follow the original as closely as possible, as in many cases the plans deal with matters of which we have no official knowledge, and we have no other guide but the plan itself. To copy the original is not always easy, for originals are often very dim and obscure in some details, and letters and figures are not always clear and unmistakeable. Twenty-five such plans were printed.

#### *Exploration Sketches.*

During recent years, surveyors of base lines have furnished sketch maps of explorations of the country twelve miles on each side of the line. These are printed in black, blue, and brown on a scale of six miles to an inch, with an accompanying profile on a scale of 1,000 feet to an inch, and are appended to the annual report of the branch. These maps and profiles give a very good idea of the country.

#### *Mounting Plans.*

Plans printed in the early days of our lithographic experience were on a soft paper, well suited for making fine prints but not calculated to stand the wear to which copies for office use are subjected. We now use a much more durable paper (though one harder for the lithographers to print on), and for copies likely to have hard usage we use buckram. The office copies of the early plans, however, are in many cases badly torn, and to remedy this we have them mounted on cotton. We have already mounted 140 plans.

#### *Miscellaneous Work.*

This work is very varied in character. One of our draughtsmen was formerly an engraver, and during the year his services were frequently requisitioned for numbering the instruments, tapes, etc., of the Special Surveys Division. The number of tapes and instruments engraved was 500. Seven designs in colour for covers of publications for the Immigration Branch were made from time to time by our artist.



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The paper used by the lithographers is ordered by this division. Most of it comes from England, but some is made in Canada. It has to be ordered some time in advance as it is not so liable to change its shape or dimensions while being printed if it has been for some time in the same atmospheric conditions which prevail in the press room. Well seasoned paper is especially desirable where maps are in several colours, and the fitting or register of the colours requires to be very accurate.

The indexing and filing of plans of value takes up considerable time. When a plan is returned from the photographer it is filed away so that if more copies are required it has only to be photographed again and printed. It usually happens that changes can be effected without making the whole plan over again. We have now over 5,000 plans of townships and over 300 miscellaneous plans filed for future use. We also have a small library of over a hundred volumes, consisting of catalogues, departmental reports, and text books bearing on our work. The supply of printed sectional maps is also in charge of this division.

*Supervision and Proof Reading.*

As stated above, the draughtsman must plan his work out to suit the subsequent operations of the photographer and lithographer. This being the case, the draughting room may be looked upon as having an interest in the evolution of a printed plan throughout its whole course. This has become more and more apparent as the work has grown in proportion. It has come to be an established custom to look to this division for information on all matters relating to the progress of a plan towards its final printed form. Proofs of all plans are read here and, if necessary, sent for a second reading to those most concerned in their issue, and instructions are given as to the photographic reduction and details of lithographing.

## BRITISH COLUMBIA SURVEYS DIVISION.

(*E. L. Rowan-Legg, Chief of Division.*)

The work of this division has been the preparing of preliminary plans from sketches sent in by surveyors, showing the progress of their work in the field, the examination of surveyors' field notes and plots, the compiling of township and other plans, the comparing of fair copies of township and other plans, and replying to requests for various information.

The work done has been as follows:—

Preliminary plans compiled, 55, and copies made, 275; surveyors' field notes of subdivision surveys examined, 25; plots, 36; of mineral claims, 7; of miscellaneous surveys, 14; township plans compiled, 97; townsite plans compiled, 3; miscellaneous plans compiled, 7; fair copies of compiled plans compared, 85; various plots and sketches made, 267; odd jobs and requests for various information dealt with, 368; draft letters and memoranda written, 667.

For the publication of reports of the surveyors engaged during the last few years in the inspection and classification of the lands in the railway belt, the detailed and general reports were collected and handed over to the Superintendent of British Columbia Lands by whom they are being edited.

For this publication, which is to be issued in pamphlet form in three volumes, maps are being prepared upon which will be shown the classification of the lands inspected, as well as all lands disposed of, timber berths, reserves, and other lands reserved from entry.

Two of these maps, for the first volume, have been compiled. This volume covers the railway belt as far westerly as the fifteenth range, inclusive, west of the sixth meridian.

For each of the two remaining volumes a similar map will be required. These have not yet been undertaken.



## MAPPING DIVISION.

*(J. Smith, Chief of Division.)*

Part of the staff of this division is engaged solely on mapping, the remainder on compiling pamphlets of information about newly surveyed districts in the western provinces.

The usual work has been continued on sectional maps.

Nine new sheets were compiled and printed, taking in the country adjacent to Dunvegan and Fort St. John, and also along Athabaska river as far north as McMurray.

Twenty-five other sheets were revised and reprinted, most of them being in the more settled parts of the provinces. They show new railways, post-offices, roads, etc. Two of these sheets are in the British Columbia railway belt, covering the country adjacent to Vancouver and to Lytton.

The map to accompany the report on the Peace River country was also revised for a new issue, and a map of part of the railway belt was prepared, to accompany Mr. Bridgland's report on the triangulation of the Rocky mountains.

Among numerous smaller jobs may be mentioned a tracing of the contour map of Banff and vicinity, on a scale of 400 feet to an inch; a map of Eastern Ontario; a map of the Atlantic ocean between Canada and Northern Europe; preparing a new edition of the "Index map"; collecting and compiling information for a new map of Banff and vicinity on a scale of one mile to an inch.

The compilation in pamphlet form of all the useful and available information regarding the newly surveyed sectional districts in the West as well as the reports of all the surveyors who have worked in these districts, has been carried out.

The material for the publication of four such pamphlets has all been made ready. These pamphlets were not printed owing to the lack of suitable maps to accompany them. A map of the St. Ann sectional district, which is to be used as a sample in the preparation of all sectional maps for these pamphlets, was compiled in this office.

A pamphlet containing the surveyors' reports of the townships surveyed between July, 1911, and July, 1912, was prepared, edited, and published.

The pamphlet containing the surveyors' reports of all townships surveyed between July, 1912, and July, 1913, was prepared and edited, and is now in the hands of the printers.

A great many of the reports on townships which are to be included in the 1914 pamphlet have been typewritten, put in proper form, and made ready for publication.

One member of this division, Mr. John Brigly, died. Mr. Brigly's death, which occurred on March 12 after a short illness, is much regretted. He was in the prime of life, was of steady, vigorous habits, fond of athletic sports, popular amongst his associates, and a good man in the office.

## SPECIAL SURVEYS DIVISION.

*(G. Blanchard Dodge, Chief of Division.)**Base Line Surveys.*

An examination is being made of the returns of survey of all base lines and meridians. This has been found necessary for the purpose of checking as nearly as possible the latitudes and longitudes of points and lines in the Dominion lands system and comparing their positions, as found on the ground, with the corresponding theoretical positions. As stated in last year's report, a number of errors of considerable magnitude were discovered in the older surveys in and around Manitoba, these errors being largely due to imperfect facilities in the earlier days of survey for testing surveyors' chains and other instruments. An investigation of all the surveys is therefore being made with the object of locating all such errors and, as far as possible, correcting them.



*Triangulation Survey.*

A reduction has been made of the triangulation of the British Columbia railway belt between the Kootenay and Salmon Arm bases. In order to carry the triangulation over the summit of the Selkirks, it was found necessary, in general, that the stations should be situated on the highest peaks. In some cases the long and hazardous climbs were fraught with considerable danger, and the exposed top of a high mountain peak presents many difficulties to rapid and accurate observing. The weather conditions, also, were all against accurate work, and often a hard climb would be undertaken only to find that the stations on neighbouring peaks were invisible or indistinct, and that good work at that station would necessitate another long climb. Under such conditions it has been extremely gratifying to find that the untiring energy and perseverance of the surveyor has enabled him to maintain a high degree of accuracy throughout the survey.

The survey necessitated the observing of angles from sixty-five stations, the accurate measurement of two bases, each about five miles in length, astronomical observations for latitude and azimuth, and considerable subsidiary triangulation and traverse work. The triangulation network extends over a length of about 160 miles of the Canadian Pacific railway, and embraces an area of approximately 5,000 square miles.

When the last results of the angle and base measurements were received at this office during the early part of the year, an adjustment of the whole survey was commenced. This has now been completed in accordance with the degree of accuracy of the angular measurements, by dividing the triangulation network into sections and adjusting by the method of least squares. It was then found that the length of the Salmon Arm base, as computed through the triangulation from the Kootenay base, differed from its measured length by about six inches. A secondary adjustment was made to correct for this slight discrepancy.

Much minor triangulation and traverse work had also to be reduced to provide ties between triangulation posts and other surveys.

As the object of the triangulation was to replace the meridians and base lines as a basis for Dominion land surveys, it was required to compute the position each station would occupy in the Dominion lands system. To do this, it was necessary to form an estimate of the unknown deflections of the vertical at the points of astronomical observations, and to make corrections for the altitude above sea-level at which the Dominion lands surveys are made. The position of each station in the Dominion lands system was then computed from its latitude and longitude by means of tables IV and X of the Supplement to the Manual.

The elevations of the stations, as determined by the observing of vertical angles, have also been computed and adjusted.

A complete report of the triangulation work and adjustment has been prepared, and is ready now for printing.

*Magnetic Survey.*

Forty-six surveyors were instructed to observe for magnetic declination, and during the miscellaneous surveys made by R. C. Purser, D.L.S., and G. A. Bennett, D.L.S., observations for magnetic dip and total force were taken at fifty-two stations. The results are given in Appendix 58. The instrumental constants of the dip circles, as determined both at the beginning and at the close of the season's work, show a probable error of less than 0.0001 c.g.s. in each case, from the mean of six observations. At nearly every station a complete set of observations was duplicated and the average range was found to be comparatively small.

The index error of every transit used was determined both at the beginning and at the end of field operations. Every observation for declination has been checked,



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reduced to the mean of the month by means of the daily records of the declinometer at Agincourt, and plotted on a large scale map.

Besides the ordinary trough compass, as described in Appendix No. 50 of the annual report of this branch for 1911-12, a telescopic pattern was used this season. The compass was first submitted to the officer in charge of the Magnetic Observatory for examination and report, and was highly approved by him. The outer shell of the compass is a brass tube, on one end of which an ordinary Ramsden eye-piece is attached. There is a glass diaphragm on which are etched two close parallel vertical lines. The needle is of the regular edge bar type, with one end bent up at right angles and ground to a very fine edge. This end swings sufficiently close to the glass diaphragm to give a good definition of the bent up edge of the needle when the eye-piece is focussed on the lines on the diaphragm. A pointing is made by bisecting the space between the two vertical lines with the needle. Only one end of the needle can, of course, be read. It is found, however, that this is more than compensated for by the increased accuracy of the readings. The needle lifter is operated by means of a milled-headed screw at the end of the compass remote from the eye-piece. The method of fastening this compass to the standard is an improvement on that used with the trough compass, and assures better permanency of the index correction.

The director of the Meteorological Service expects to establish a self-recording declinometer this season, somewhere in the province of Alberta. This will be of great value in the reduction of our observations.

Returns for magnetic declination received to date for 1913.....	1,295
Previous returns, since 1908 .....	4,119
Total returns, to date .....	5,414
Dip observations received for 1913 .....	145
Previous returns, since 1908 .....	144
Total force observations for 1913 .....	94
Previous returns, since 1908 .....	120

### *Astronomical Work.*

*Azimuth Observations.*—All the azimuth observations taken on base lines and meridians during the summer season of 1912 and the winter season of 1912-13 have been received at this office and examined during the year. The effect of the careful examinations made and the strict supervision which has been exercised by this office in regard to the accuracy of the meridians and base lines run, is now becoming evident in the great increase in the accuracy of the work being done. The following table shows a brief résumé of the azimuth work of the four seasons 1909-12:—

	1909.	1910.	1911.	1912.
	"	"	"	"
Average correction per mile of line.....	5.5	6.5	2.7	2.1
Miles of line per azimuth station.....	4.3	3.8	3.9	4.5
Average number of observations per azimuth station.....	1.6	2.0	2.4	2.6
Average range of observations at an azimuth station.....	17"	14"	11"	9"

The greatly reduced average corrections to the lines run in the different seasons illustrate very clearly that much greater skill and care are being exercised to run an accurate line on the theoretic bearing. No less important is the fact that the determinations of azimuths are much more accurate than formerly, as is evidenced both by the smaller range of the observations and by the greater number of observations taken at



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a station. Thus where, a few seasons ago, the azimuth of the line was often determined and a correction applied on the result of one comparatively poor observation with an uncertainty of fifteen or twenty seconds, it is now customary to take two or more observations at a station determining the azimuth usually to within five seconds. The objectionable practice of making corrections to the line on the result of a single observation is now but seldom resorted to.

The instruments used for observing during the seasons 1909-12 were, with but one or two exceptions reiterating instruments, having a six-inch circle with three verniers reading to 0.004 degrees ( $14''\cdot4$ ). The new pattern of transit now being used by all base line surveyors, furnished with a micrometer eye-piece and micrometer microscopes, should result in a still further improvement in the accuracy of the azimuth determinations and of the azimuths of the lines run. From the examination of the 1913 observations already received, this expectation would seem to be fully realized.

The larger parties now being employed, and the faster progress usually attained, often make it difficult for a surveyor to observe at such frequent intervals along the line as formerly; under these conditions it is necessary that a close supervision be kept, to ensure that no surveyor shall allow other considerations to stand in the way of his attaining a requisite degree of accuracy in his surveys.

The more northern latitudes in which the meridians and base lines are now being established, and the greater precision required in the azimuth observations, have necessitated a revision of the azimuth observing books and an extension of the tables of addition logarithms as given in table XVII of the Supplement to the Manual.

*Star List.*—In observing for latitude by Talcott's method, the latitude of the point of observation governs the stars eligible for making the determination; and since an observation may be required at any point north of the international boundary, it follows that a large number of suitable stars must be available. The various ephemerides and star catalogues published, as a whole, contain this information; but the number, size, and weight of the books prohibit their use in the field, where transportation is always so difficult. Also the fact of having to refer to so many separate books was decidedly inconvenient.

To obviate these difficulties, a Catalogue of Stars has been prepared embodying in one book the information of the different ephemerides and star catalogues, and this information has been reduced to the common epoch 1910.0 and put in the form most convenient for latitude work.

The Star Catalogue comprises over 5,000 suitable latitude stars, and the work involved in compiling the list was considerable, being in excess of 66,000 separate computations. Much data useful in latitude computations are given in the catalogue, and the various methods of star reductions are explained.

In conjunction with the revised and extended 1914 edition of the Star charts, this Star catalogue gives all the information necessary for latitude work in the field.

•

*Astronomical Field Tables.*

On account of the large amount of subdivision work now being made in the Peace River district, it has been found necessary to extend the Astronomical Field Tables from township 80 to township 140. In addition to giving the altitude and azimuth of Polaris, the field tables gave the sun's apparent right ascension for each day, and the right ascensions of forty-five bright stars for time observations.

As the apparent path of Polaris, due principally to precession and aberration, is such that the star has almost the same position in January, February, and March of one year, and April, May, and June of the next, taking a mean position of the star for these periods introduces no great error. Similarly a mean position may be taken for November and December, September and October, and July and August of three



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consecutive years. In order that the tables may be issued in time, they must be computed almost a year before required. The Nautical Almanac is supposed to be published two years ahead, but every year the computation of the tables has been delayed by the difficulty experienced in getting it, and each year this difficulty has increased. The right ascension and declination of Polaris can be extrapolated from the positions of former years, giving no appreciable error in the mean position of the star. In the same way the positions of the time stars can also be found sufficiently accurately from former values. But this method was not applicable for finding the right ascension of the sun. It was therefore decided to make a change in the form of the tables, the sun's right ascension being omitted from the Polaris tables and given separately for a whole year. The change was first made for the 1914 tables.

In the past two years a number of surveyors have been employed making traverses of lakes, etc. Often they spend only a short time at one place. On account of cloudy weather, frequently they have been unable to observe the pole star and have been compelled to resort to sun observations. Tables were therefore prepared giving the sun's apparent declination.

The maximum error in the table for the azimuth of Polaris is now much greater than when the tables were first prepared. Extending the tables from township 80 to township 140 has increased it by over 16 per cent. The change in the path of Polaris has produced a still greater effect, and as the error due to this cause is increasing, an investigation will be made with the purpose of finding a more suitable arrangement of months.

#### *Levelling.*

The levelling operations of the branch are now under the direction of Mr. J. N. Wallace at Calgary, but as he was not in a position during the past year to plot profiles from the levels, this work has been done here.

Profiles have been made showing levels run along 1,324 miles of base lines and meridians. These profiles are made on a large scale for office use, and on a smaller scale for publication in the annual report.

#### *Surveying Instruments.*

The work of this division includes the outfitting of surveyors with surveying instruments, such as transit theodolites, precise levels and levelling rods, stadia rods, steel measuring tapes, clinometers, aneroid barometers, sidereal watches, surveying cameras, etc. These are all of special design, adapted to the conditions and requirements of Dominion lands surveys. A complete stock of instruments is maintained, and they are packed and shipped, as required, to the surveyors in the field. Repairs to surveyors' instruments are also made under the supervision of this office. As upwards of seventy survey parties have to be cared for each season, a considerable amount of work is involved. To give some idea of this, it may be stated that 393 packages, weighing about 16,500 pounds, or  $8\frac{1}{4}$  tons, were shipped out by express last year, and 142 packages, weighing about 8,200 pounds, or over 4 tons, were received.

#### *Surveys Laboratory.*

During the past year ten block survey transits, fifty-four D.L.S. subdivision transits, and eighteen levels have been tested, adjusted, and the constants determined. Forty-nine sidereal watches have been tested for isochronism and temperature compensation. In addition to the regular work, a large amount of time was devoted to the installation of the new apparatus at the Comparator building. A special cut-out arrangement for the new Cooke astronomical transit has been designed and constructed, and also a low temperature box for watch testing.



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All the watches purchased by the department and afterwards sold to surveyors for use on Dominion lands surveys are submitted to test before being accepted. The test is of forty-four days' duration, divided into eight periods of five days each, with four intermediate and extra days.

1. Watch in the vertical position, pendant up, temperature 65°.
2. Watch in the vertical position, pendant right, temperature 65°.
3. Watch in the vertical position, pendant left, temperature 65°.
4. Watch in the horizontal position, dial up, temperature 40°.
5. Watch in the horizontal position, dial up, temperature 65°.
6. Watch in the horizontal position, dial up, temperature 90°.
7. Watch in the horizontal position, dial down, temperature 65°.
8. Watch in the vertical position, pendant up, temperature 65°.

The four intermediate days when the rate of the watch is not recorded are at the commencements of the fourth, fifth, sixth and seventh periods, which are extended one day each for that purpose.

The watches are set going and allowed to run for a week in the dial-up position before the tests begin.

The conditions of the tests are as follows:—

1. The mean daily variation of the mean daily rate in any period must not exceed 2 seconds.
2. The mean error  $\alpha$  of the mean daily rates for all the periods must not exceed 0.75 seconds.
3. The mean daily rate in any one of the five position tests must not differ from the mean of the mean daily rates in the five positions by 7.5 seconds.
4. The mean error  $\beta$  of change of rate for change of position must not exceed 3.5 seconds.
5. The mean daily rate at 40° F. must not differ from the mean daily rate at 90° F. by more than 0.3 seconds per degree F.

All watches which fail to meet these conditions are not accepted. The conditions are pretty severe for ordinary commercial watches; only the most skilled workmen in the factories are able to adjust the watches with the required delicacy. Of the forty-nine tests made during the year, five were special tests, and forty-four regular. Twenty-three watches passed the test, and as two of these were examined twice, 25 or 57 per cent of the tests were successful as against 15 or 25 per cent for the preceding year. The much larger percentage of watches which passed during the last year is undoubtedly due to the fact that the makers now realize that greater care must be given to the adjustments, if the watches are to be accepted.

In reference to the conditions of the test, conditions 1 and 2 are the tests for isochronism, 3 and 4 for position, 5 for temperature compensation. Of the nineteen watches which failed, four were withdrawn before their tests were completed. Of the remaining fifteen, five failed to fulfil condition No. 1, five condition No. 2, seven condition No. 3, and seven condition No. 4, or seven watches failed in isochronism, nine in position, and one in temperature compensation.

Comparing the average errors of the watches which passed with those for 1913 we have the following:—

	1913.	1914.
Average error for isochronism.....	0.59	0.45
Average error for position.....	2.58	2.03
Average error for compensation.....	0.14	0.10



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The average errors for isochronism of the twenty-three watches which passed were as follows:—

P.U	P.R.	P.L	D.U.	D.U.	D.U.	D.D.	P.U.
Os.59	Os.50	Os.42	40° Os.44	65° Os.47	90° Os.38	Os.32	Os.48

The smallest error for  $\alpha$  was 0°.26. Ten were less than 0°.4 and two less than 0°.3. It is interesting to note that both in the watches which passed and in those which failed the average error is lowest in the dial-down position and highest in the pendant-up position. In the temperature tests the lowest errors for isochronism were in both cases in the 90° temperature box.

The average errors for position of the watches which passed are as follows:—

P.U	P.R.	P.L.	D.U.	D.D.
1s.84	2s.46	2s.65	1s.59	1s.81

The smallest error for  $\beta$  was 0°.72. Eleven were less than 2°.0 and two less than 1°.5. Both in the watches which passed and in those which failed the largest average error is in the pendant-left position.

The compensation for temperature is remarkable. The average temperature coefficient is 0°.09. One watch had a coefficient of 0°.02, and one a coefficient of 0°.03. Of the forty-nine tested, only one exceeded the limit.

The results of the trials of the twenty-three watches which passed is given in Appendix 59.

Past experience has shown the hot-water temperature box to be preferable to the straight electric type. Being unable to purchase a temperature box from any standard line to run at 40° F., it was decided to have one constructed locally to our own specifications. It was considered advisable to provide a much larger ice chamber than usually supplied, also as perfect insulation as possible. Figure 1 shows a section through the temperature box as finally constructed.

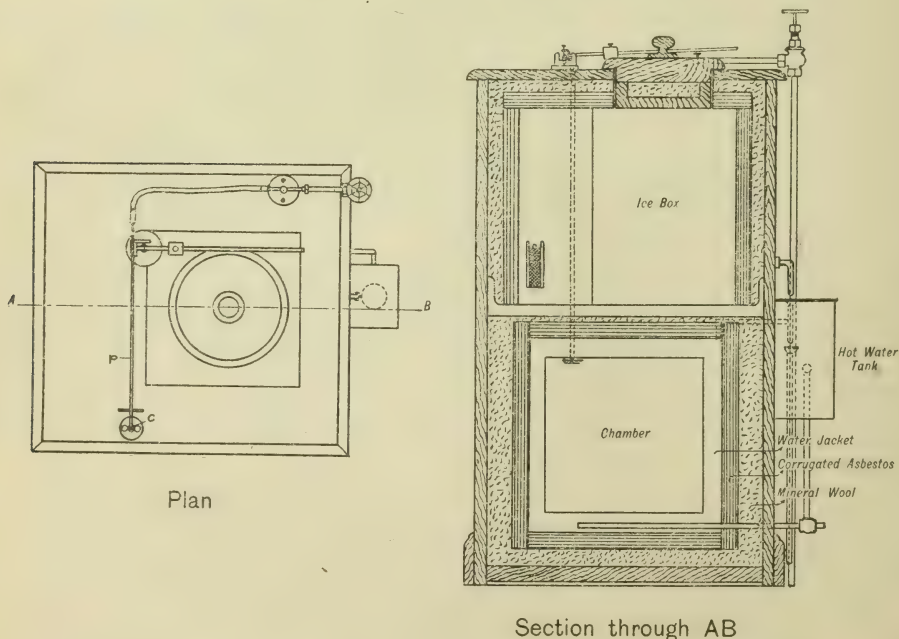


FIG. 1.—Temperature box, 40° Fahrenheit, for watch testing.



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Surrounding the ice-box and temperature chamber is a special insulating material, 1½-inch thick, of corrugated asbestos sheathing, affording five alternate air spaces and sheathings of asbestos. Between this special insulation and the wall of the temperature box is a space varying from 1-inch to 1½-inch, filled with mineral wool. The chamber of the temperature box is fitted with two tight-fitting doors, with an air space between them.

The water jacket surrounding the chamber has been increased 50 per cent above that used in ordinary temperature boxes of this type. The increase in water space decreases the liability to any sudden change of temperature in the chamber. One other special feature is the addition of a small separate chamber in the ice-box compartment from which the cold water flows to the jacket surrounding the chamber. Before the water from the ice chamber can enter this compartment it passes through a fine sieve to remove any dirt and prevent clogging of the piping inside.

The regulator parts, proper, are very similar to those used on the Hearson temperature boxes. A capsule inside the chamber expands or contracts with slight changes in temperature, and causes the feed pipe "P" to swing to the right or to the left, as necessary to correct the temperature and the water flows into the hot-water tank or ice chamber and from there to the water jacket. When the temperature is correct in the chamber, the feed pipe remains in a central position and the water flows away through the waste pipe "C".

Some difficulty was experienced in obtaining a liquid sufficiently volatile to be used in the capsules at 40° F. Rhegolene was first used, as it boils below this temperature, but it was found the vapour pressure was not great enough to be used in the ordinary capsule. Ether is now used in place of rhegolene. The capsules can only be filled during the cold weather.

The temperature box has been in operation for some time and has given excellent results, the variation in temperature in the chamber being less than ½° F.

Time observations for checking the rate of our clock have been taken in the past with a small portable transit made by Messrs. Troughton and Simms. The instrument is very old, and at some time has evidently received very rough usage and is in bad repair. This year a new instrument was purchased from Messrs. Cooke and Sons. The telescope has a 3-inch objective of 36 inches focal length, and is fitted with a transit or registering micrometer. The instrument has a beautiful telescope and the workmanship on the whole transit is very fine, but the transit micrometer as furnished was not complete in that no cut-out was provided and no means of identifying the various contacts. After using the instrument for some time in this way, it was finally decided to design a cut-out apparatus ourselves and have the necessary alterations to the micrometer made locally. The principle of the cut-out design is somewhat similar to that used by the United States Coast and Geodetic Survey at Washington. The mechanical construction, however, is entirely different owing to the fact that no arrangement was provided by the makers for such a device on the instrument. It was found difficult to place the mechanism in a neat and compact manner.

While installing the cut-out, the opportunity was taken of improving the recording device, which was of the break-circuit type. The standard voltage of the chronograph is four volts and, with a small voltage of this nature in conjunction with the break circuit, misleading records are liable to occur due to any dirt or irregularity on the contact surfaces, unless an unduly high pressure is maintained between them. The recording device was changed to the make-circuit type, the micrometer transmitting its records through a relay to the chronograph. This permits the use of a strong current through the contact points of the micrometer head, ensuring the record of each contact and a minimum pressure upon the micrometer head by contact spring.

The cut-out provides that the micrometer transmits no records except those made within an accepted space on either side of the line of collimation and forming the observations of transit of the star.



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Figures 2 and 3 show the construction as finally adopted. In Figure 4 is shown the complete instrument, with attachment.

The micrometer screw which carries the slide with the movable wire is geared to the hand wheel shaft (*s*) by a two-to-one gearing. Mounted on the micrometer screw is the micrometer drum (*c*), worm gear (*d*), and ebonite drum (*e*) with contact strips (*f*). On the end of the telescope is mounted a fibre bracket (*g*) which carries the break-contact device, and gear (*h*), the gear engaging with the worm gear (*d*). This turning of gear (*h*)—of which the upper part is slotted—by the worm gear, causes lever (*l*) to break the contact at proper intervals. One special feature of gear (*h*) is that the upper half may be removed and replaced by another part giving different periods of contact. A second feature is the double pitch of the worm gear (*d*) which ensures a rapid make and break contact.

The instrument with this mechanism is now in use and is giving entire satisfaction.

The Comparator building has been completed and the comparator installed. While the equipment is not yet altogether complete, it is possible to make very precise measurements and to verify the tests of our D.L.S. subsidiary standards with confidence. That a building of this nature is needed for the engineering profession in Canada is evident from the number of requests which have been received from surveying instrument dealers and others to have measures verified. Although the comparator has been in operation but a short time, 153 tapes have been tested for outside parties at their request. For Dominion lands survey purposes, 112 D.L.S. subsidiary standards have been standardized, and also eighteen surveying tapes for base line surveyors. Four precise levelling rods have also been tested. A description of the apparatus and method of testing will be published later in separate monograph form.

#### *Correspondence.*

The number of draft letters prepared was 1,808. Seventy letters of instructions to surveyors were prepared, and 490 memoranda written.

#### PHOTOLITHOGRAPHIC OFFICE.

*(H. K. Carruthers, Process Photographer.)*

About 1887 saw the beginning of the photographic office. All maps and plans were reproduced by the wet-plate process, and from these negatives the photo-litho transfer was made.

A specially prepared India paper was coated and sensitized, and when dry was exposed to the light through the negative. Afterwards this print was inked over with a thin coating of lithographic transfer ink and washed under the tap, when a complete fac-simile of the original was obtained. Immediately this was transferred to the prepared stone previous to its being printed in the power press.

This system had many drawbacks, as after sensitizing the paper it had to remain over night to dry, and should the following day be dark or rainy, exposures could not be made. This was before arc lamps were installed. If this print was incorrectly exposed, it meant a spoiled paper. Another big disadvantage was the copying of a map in sections. After passing through many stages of wettings no two sections were alike in size and had to be faked in the joining.

In 1903 the first and present up-to-date photolithographic plant was installed. Negatives ranging from 18 inches by 20 inches down to 8 inches by 10 inches were made. All plans and townships were drawn on larger sizes and reduced to proper scales, making the final results clear and sharp. Thin sheets of fine-grained zinc were



## SESSIONAL PAPER No. 25b

used in printing from the negatives, and these could be stored away indefinitely for future use. Larger printing frames were installed with 5,000 c.p. arc lamp, and a large tournette for the coating of the zinc plates. The largest zinc plate used at this time was 18 inches by 20 inches, larger plates being unnecessary, as the camera did not accommodate larger sizes.

To facilitate handling the township plans, which were increasing in numbers, a special iron bed was obtained for the printing press. This bed was the thickness of standard litho stone, and with the clamps attached to each end, the zinc plates, with the image thereon, were securely fastened on, ready for the run. This method obviated the necessity of pulling transfers and materially increased the output in the printing department. The average number of impressions taken from each township was 225.

In 1910 the department installed a large offset printing press, taking plates 49 inches by 32 inches and steps were taken to enlarge the size of our camera to take negatives 28 inches by 32 inches. A large vacuum printing frame, 62 inches by 38 inches and four 50-inch mercury vapour tubes were installed, the dark-rooms and sinks being increased in size.

The townships were photographed on glass 15 inches by 18 inches. Three of these negatives were placed side by side and exposed on the 49 by 32-inch sheet of zinc. Three-mile sectional maps that had previously been copied in two sections were now done on one negative with headings and footnotes complete. These were placed on the press and printed without any further preliminaries.

Ten years ago the average number of negatives made monthly was fifty-four. During the month of March, 1914, a total of 275, ranging in size from 24 inches by 32 inches to 8 inches by 10 inches, was the output.

The staff at present consists of the photographer, four assistants, and two apprentices.

A schedule of the work for the year is given in Appendix No. 7.

## PHOTOGRAPHIC OFFICE.

*(J. Woodruff, Chief Photographer.)*

General photographic work has increased about 50 per cent over that of last year. It has grown to such an extent that more help and larger quarters must be secured or the work will have to be curtailed. Even now it has been found necessary to curtail some of the work which we have been doing for other branches of the department. For the Forestry Branch alone nearly 10,000 prints were made, and about 1,000 negatives developed.

The space in the top floor of the Metcalfe Street building being required by the process photographer, most of the apparatus belonging to the chief photographer was moved to the basement, the blue-print and Vandyke work only being now done on the top floor.

A new camera (Fig. 5), specially designed for enlargements has been installed in the basement. Accuracy and a wide range of usefulness are its two outstanding features.



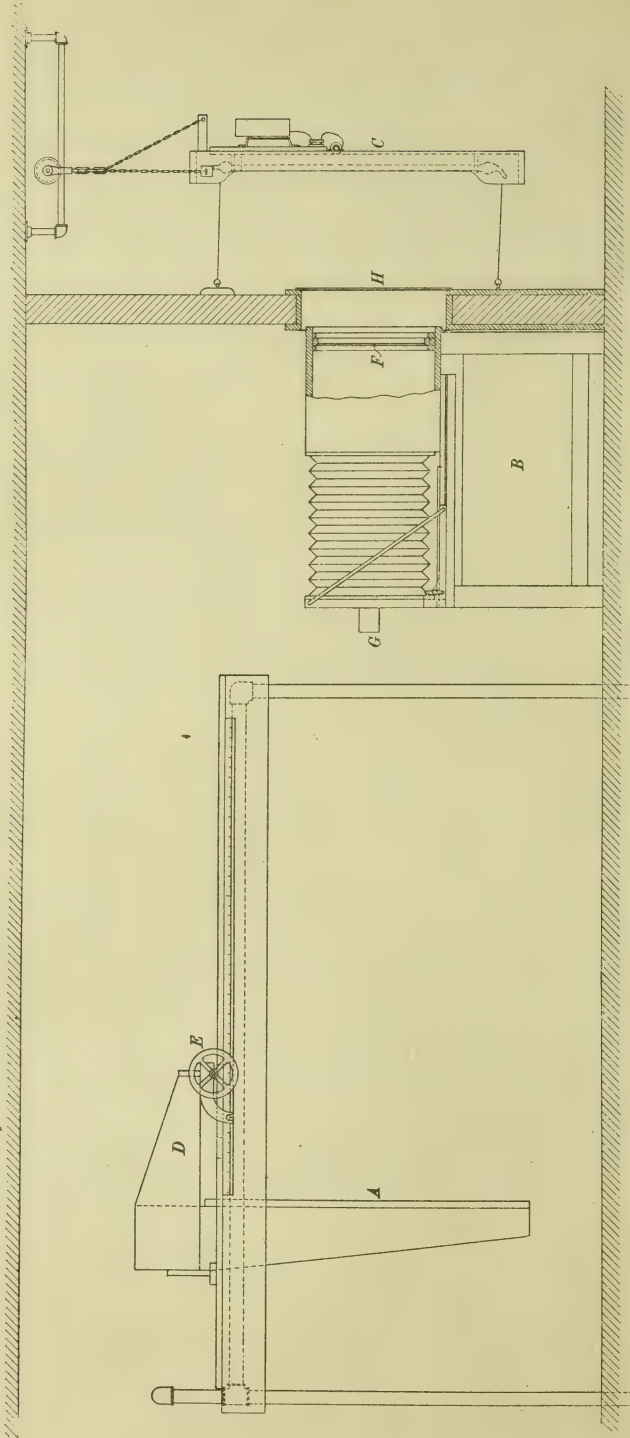


FIG. 5.—Vertical Section of Enlarging Camera.



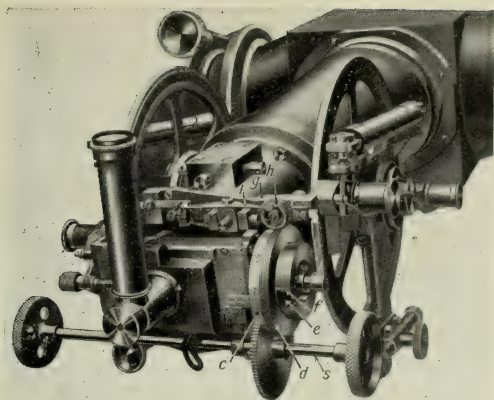


FIG. 2.  
Transit Micrometer—Drum on Right.

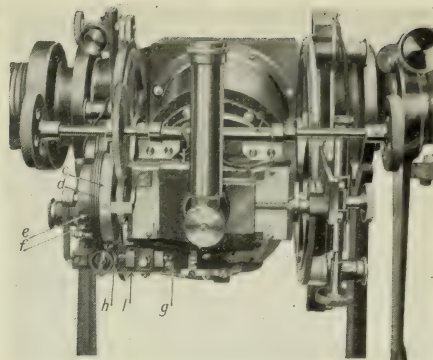


FIG. 3.  
Transit Micrometer—Drum on Left.

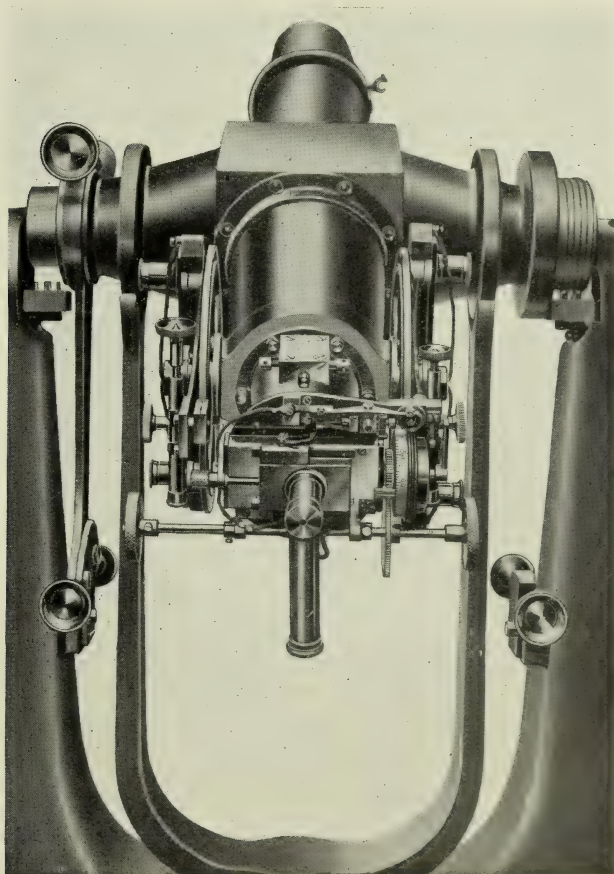


FIG. 4.  
Astronomical transit with Transit Micrometer.







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The whole arrangement consists of three parts, the easel *A*, on which the sensitive paper is placed, the camera *B*, which carries the negative *F* and lens *G*, and the light *C*, which illuminates the negative, *H* being ground glass between the negative and the light. The easel is supported on a frame of steel tubing with four 2½-inch posts, the lower ends of which are embedded in the concrete floor, making the frame perfectly rigid. The dimensions of the frame are 5 feet wide and 11 feet long. A steel track *I* (Fig. 6) runs the length of the frame on each side. A rack *J* runs on

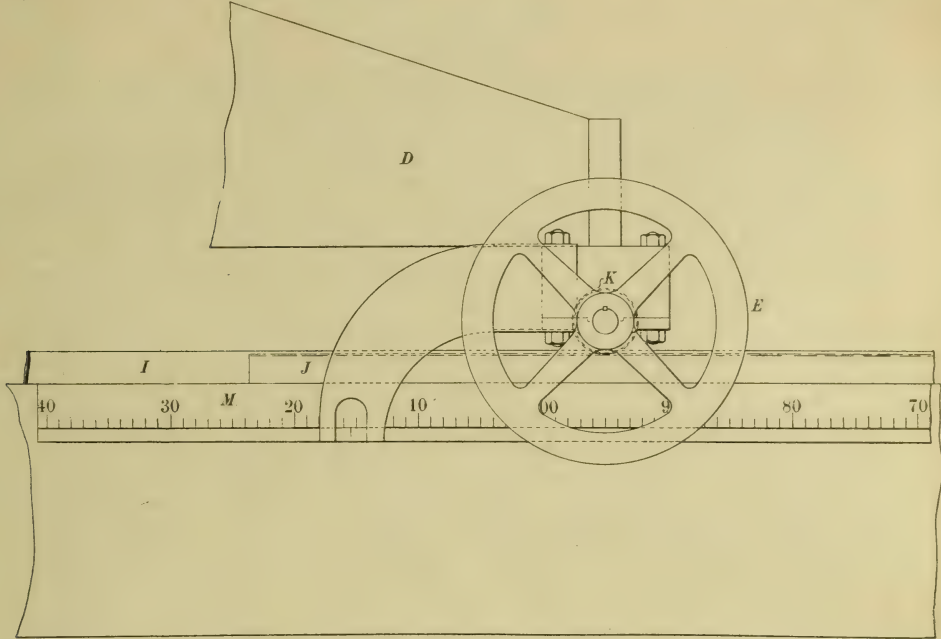


FIG. 6.—Rack and Scale for easel carriage—Enlarging Camera.

the frame supporting the carriage *D* which carries the easel, and enabled it to be moved forward or backward by means of a hand wheel *E* and pinions *K* which engage the rack.

The easel is 4 feet by 5 feet, and will take an enlargement of that size.



The camera is 4 feet long and 2 feet square, and will take a negative up to 20 inches square. It is supported on a heavy frame bolted to the floor. Adjustment is provided for by the crank *N* (Fig. 7), operating pinion *O* on rack *P*.

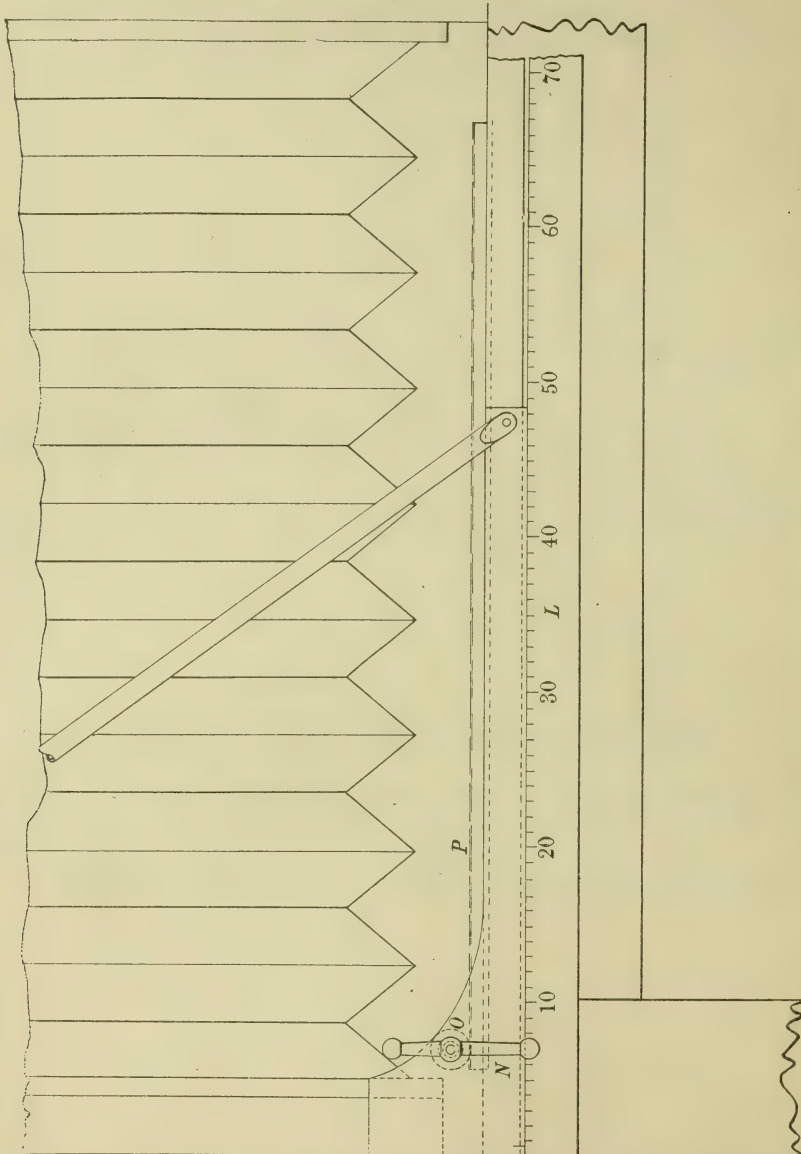


FIG. 7.—Rack and Scale for lens—Enlarging Camera.

The camera and easel are fitted with scales *L* and *M*, graduated to millimeters. This does away with all focussing, as the apparatus is simply set to scale for any size of enlargement.

The camera is also used for making lantern slides and transparencies of all sizes.

The light *C* (Fig. 5), consists of five Cooper Hewitt mercury vapour tubes which give a fine even illumination, and is much more satisfactory than daylight. A ground glass *H* is placed in front of the light, behind the negative, to diffuse the light still further.



## SESSIONAL PAPER No. 25b

A great deal of time is saved by this camera in reducing or enlarging maps, plans, etc., to the required scale; work which formerly required weeks to perform is now done in a few hours, and in a much more satisfactory manner.

The numerical strength of the staff is the same as last year, one clerk resigning and one being appointed.

## LITHOGRAPHIC OFFICE.

(*A. Moody, Foreman.*)

The work of the lithographic office continues to increase steadily, as shown by the statement of work done, in Appendix 8. Two power presses are used, one a flat-bed machine capable of printing either from stone or from zinc plates, the other a rotary offset press printing from zinc plates only. One essential difference between the presses is that for the flat-bed press the work on the plate or stone is reversed, so that when the sheet of paper to be printed comes in contact with the work and receives a print, the print reads correctly. With the offset press the work on the plate reads correctly; a reverse print is made to a rubber blanket which in turn prints a correct copy on the paper. It is therefore necessary in preparing work for these presses to keep in mind this difference, as any plate prepared for one press must be reversed before the other press can print it. This reversing may be done by transferring but this usually thickens up the work and causes a loss of sharpness. A preferable way is to reverse by photography, and as most of the work is photographed, it is merely necessary to determine upon which press a job is to be printed, and the photographer arranges the matter by copying either direct or through a mirror as desired. The offset press is a later development in lithography and is capable of a higher rate of speed than the flat-bed. It is therefore used in long runs. The printing of annual report maps and of township plans forms the bulk of the work turned out. Of the latter, 203 copies only are printed; 3 on linen, 170 on thin paper for mailing purposes, and 30 on thick paper for ordinary office use.

More time is required for preparation and adjustment of press to meet the conditions relative to the printing on each kind of paper than would be required for a straight run on only one kind of paper. The same would apply regarding the necessity for frequent changes when more than one colour is used in printing a plan or map.

The flat-bed press is easier to change from one colour to another, and is consequently used much for colour work or for short runs. The printing of the 3-mile sectional maps in three colours, black, blue, and brown, has been undertaken, and provides considerable additional work for the flat-bed press. Reprints of township plans originally issued in colours have also given much colour work.

The largest size of paper used is 24 inches by 34 inches, so that the maximum size of map which can be printed is about 22 inches by 32 inches, varying a little with the allowance for margin.

## GEOGRAPHIC BOARD OF CANADA.

(*A. H. Whitcher, Secretary.*)

The twelfth annual report of the board, containing a consolidation of the decisions published in previous reports up to June 30, 1913, has been published and distributed. This report is now printed as a supplement to the report of this department, as the chairman of the board is the Surveyor General. The secretary is also a member of the staff of the Topographical Surveys Branch.

Regular meetings of the board have been held throughout the year, and the bulletins containing the decisions published from time to time in the *Canada Gazette*. A number of these bulletins have also been published separately and distributed by the secretary.



## BOARD OF EXAMINERS FOR DOMINION LAND SURVEYORS.

(F. D. Henderson, Secretary.)

Two meetings of the Board of Examiners were held during the year. The first was a special meeting for the examination of candidates, and lasted from April 28 to May 29, 1913, inclusive. Examinations were held at Ottawa, Toronto, Calgary, and Edmonton. The second was the regular annual meeting of the board provided for in section 9 of the D. L. S. Act. It lasted from February 9 to April 1, 1914, inclusive. Examinations were held at Ottawa, Halifax, Montreal, Kingston, Toronto, Winnipeg, Regina, Calgary, Edmonton, and Dawson, Y.T. The total number of candidates examined was 287. The following table shows the number who tried at each centre, and the number who were successful:—

Places.	FULL PRELIMINARY.		LIMITED PRELIMINARY.		FINAL.		D. T. S.		TOTAL.	
	Tried.	Passed.	Tried.	Passed.	Tried.	Passed.	Tried.	Passed.	Tried.	Passed.
<i>April-May, 1913.—</i>										
Ottawa.....	19	6			21	12			40	18
Toronto.....	5	2			8	6			13	8
Calgary.....	8	6	3	2	4	2			15	10
Edmonton.....	11	4	1	0	4	1			16	5
<i>February, 1914.—</i>										
Ottawa.....	29	6	4	2	19	9	4	1	56	18
Halifax.....	2	1			2	2			4	3
Montreal.....	21	8	1	0					22	8
Kingston.....	28	6							28	6
Toronto.....	24	4	2	0	9	3			35	7
Winnipeg.....	5	2			1	0			6	2
Regina.....	5	3			1	1			6	4
Calgary.....	11	3	1	1	10	1			22	5
Edmonton.....	19	4			3	0			22	4
Dawson.....	2	0							2	0
Total.....	189	55	12	5	82	37	4	1	287	98

Following are the names of the successful candidates:—

*Full Preliminary and Limited Preliminary Examinations (60).*

Alexander, John Bentley, Calgary, Alta.

Bannister, George William, Ottawa, Ont.

Beach, Floyd Kellogg, Calgary, Alta.

Biddell, Cecil Henry, Regina, Sask.

Bonham, John C., Kingston, Ont.

Bostock, Achilles, Banff, Alta.

Buck, Cameron Alexis, Edmonton, Alta.

Burfield, Francis Robert, Calgary, Alta.

Calder, Leslie Raymond, Nanaimo, B.C.

Carroll, John, Toronto, Ont.

Carter, John Lark, Calgary, Alta.

Cohoon, Carl William, Ottawa, Ont.

Cole, William Stanley, Brockville, Ont.

Crowell, Clement William, Yarmouth, N.S.

DesBrisay, Eric Merrill, Vancouver, B.C.

Donaldson, Garnet Hilliard, Ottawa, Ont.

Lindsay, Charles Crawford, Quebec, P.Q.

Lyon, John Edward, Ottawa, Ont.

Martin, Frederick John, Winnipeg, Man.

Meitz, Walter H., Pembroke, Ont.

Mills, Arthur McIntosh, Ottawa, Ont.

Mills, Thomas Stanley, Kingston, Ont.

MacKenzie, Hugh Ross, Regina, Sask.

McDonald, William Sutherland, Embro, Ont.

McFarlane, Maynard Deedes, Montreal, P.Q.

McIntosh, John Stuart, Morrisburg, Ont.

Nelson, Edward, Streamstown, Alta.

Parker, Henry Albert, Havelock, Ont.

Patterson, George B., London, Ont.

Paul, John McNeill, Calgary, Alta.

Pelletier, Henri Burrough, Montreal, P.Q.

Perry, Alfred Melville, Banff, Alta.

Prittie, Lloyd Conn, Pembroke, Ont.



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Fawcett, Thomas Gordon, Ottawa, Ont.  
 Frame, William Taylor, Vancouver, B.C.  
 Fullerton, James Thornton, Victoria, B.C.

Gammon, Albert Osborne, Calgary, Alta.  
 Gass, Lawrence Henderson, Iroquois, Ont.  
 Gray, Edwin Roy, Toronto, Ont.  
 Guignard, Ernest Auguste, Ottawa, Ont.

Jones, Cyril, Calgary, Alta.  
 Joslyn, Cecil Earl, Sinaluta, Sask.

Keeping, Kimball F., Murray Harbour, P.E.I.  
 Kezar, George Lennox, Britannia Heights, Ont.  
 Knight, Albert Matthew, Edmonton, Alta.

Lawrence, Charles Albert Rutter, Toronto, Ont.

Prinsep, Garnet T. T., Ottawa, Ont.

Ramsay, James Harold, Ottawa, Ont.  
 Riddell, John Morrison, Toronto, Ont.  
 Richer, Cuno Edward, Ottawa, Ont.  
 Robertson, James, Lachine P.Q.  
 Russell, John, Edmonton, Alta.

Scandrett, Frederick Raymond, Calgary, Alta.  
 Sharpe, David Neville, Winnipeg, Man.  
 Smith, Gordon J., Kingston, Ont.  
 Tory, Charles Howard, Edmonton, Alta.  
 Trelle, Hermann William, Edmonton, Alta.

Wall, George, Albert, Crescent, Alta.  
 Wilkins, Arthur G., Ottawa, Ont.  
 Wright, Harold Colin, Sandhurst, Ont.

*Final Examination (37).*

Alport, Frederic, Orillia, Ont.  
 Bartley, Thomas Holmes, Toronto, Ont.  
 Barton, Harold Miall, Ottawa, Ont.  
 Bingham, Harold Carr, Moosejaw, Sask.  
 Bolton, Lambert Ernest Stanley, Wiarton, Ont.

Clarke, Roger Fyfe, Hamilton, Ont.  
 Coté, Joseph Martial, Ottawa, Ont.

Dozois, Leo Oswald Ross, Calgary, Alta.  
 Dynes, Richard Ffiorde, Pembroke, Ont.

Edwards, William Muir, Edmonton, Alta.  
 Ewan, Hedley Jenkins, Yarmouth, N.S.

Grant, Alexander Macdonald, Ottawa, Ont.  
 Griffin, Albert Dyke, Elk Lake, Ont.

Fredette, Joseph Fredelin, Ottawa, Ont.

Huffman, Karl, Toronto, Ont.

Johnston, Robert Henry, Toronto, Ont.

King, James Albert Shirley, Ottawa, Ont.

LeBlanc, Pierre Maxime Henri, Ottawa, Ont.

Logan, Robert Archibald, Middle Mosquodoboit, N.S.

Macdonald, Colin Stone, Ottawa, Ont.  
 Macdonald, James Atwood, Ridgetown, Ont.  
 Morency, Georges, Lévis, P.Q.  
 Moulton, Hazen Parker, Ottawa, Ont.  
 MacIlquham, Walter Lloyd, Ottawa, Ont.  
 MacRostie, Norman Barrie, Metcalfe, Ont.  
 McGarry, Patrick Joseph, Merriton, Ont.  
 McKnight, James Henry, Simcoe, Ont.

Norrish, Wilbert Henry, Guelph, Ont.

Pierce, Benjamin Clifford, Kingston, Ont.  
 Pounder, Irvine Rudsdale, Ottawa, Ont.

Roberts, Otto Beer, Murray Harbour, P.E.I.

Sharpe, George Pearce, Agassiz, B.C.  
 Steers, Francis Paul, Ottawa, Ont.  
 Squire, Richard Lane, Ottawa, Ont.

Van Skiver, Leighton Adelbert, Fish Lake, Ont.

Wrong, Frederick Hay, Chatham, Ont.

Young, Stewart, Owen Sound, Ont.

*Examination for Certificate as Dominion Topographical Surveyor.*

Rannie, J. L., Ottawa, Ont.

The examinations at all the centres are held simultaneously and according to a time-table approved by the board; and the presiding examiners have instructions to transmit each night to the secretary at Ottawa, the answer papers received during the day. As the papers are received at Ottawa they are distributed to the members of the board. The members being busy during the day with departmental business, the papers have to be read at night, and where the number of candidates is large, as it has been for some years, the work becomes very arduous.

At the meeting in April and May, complete sets of papers were prepared for use at the examination in February, 1914, and at the meeting in February other sets were prepared for the examination in April and May, 1914.

For some time it has been felt by the members of the board that the writing of candidates who came before them is very bad and that the answer papers also left much to be desired in the way of neatness and orderly arrangement. After considerable discussion it was decided to amend the rules and regulations so as to provide for a subject "Penmanship and Neatness," for which a certain number of marks would



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be allowed on each paper. "Penmanship" is taken to be "the quality of ordinary writing;" and "neatness," "the clean, orderly, and tidy condition of the written answers to the questions." It is hoped by this means to secure not only more creditable papers from candidates, but to impress upon these young men seeking to enter the surveying profession the need of legible writing and of neatness and care in the preparation of the returns of survey.

Several college graduates applied to be admitted to the shorter term of service as provided in section 22 of the D.L.S. Act. Favourable decisions were given in the case of a graduate in civil engineering of the University of Colorado and in the case of a graduate of the Nova Scotia Technical College at Halifax.

Mulford's "Boundaries and Landmarks" and Cautley's "Descriptions of Land, a Textbook for Surveying Students" were added to the list of books of reference for final candidates.

Thirty-nine commissions as Dominion Land Surveyors were issued to those who had passed the final examination and had furnished the oath of office and oath of allegiance and bond as required by section 25 of the Act.

Thirty-two standard measures were issued during the year. Twenty-eight of these went to Dominion Land surveyors and two to provincial surveyors.

A list of Dominion Land surveyors who are in possession of standard measures, corrected to March 31, 1914, will be found in Appendix No. 10.

The correspondence of the board was as follows: letters received, 1,727; letters sent, 920; circular letters, pamphlets, notices, etc., sent, 1,654.

The following table shows the number who have tried the various examinations each year since 1900, and the number and percentage of successful candidates.

Fiscal Year.	PRELIMINARY.			FINAL.			D. T. S.			TOTAL.		
	Tried.	Passed.	Per cent Passed.	Tried.	Passed.	Per cent Passed.	Tried.	Passed.	Per cent Passed.	Tried.	Passed.	Per cent Passed.
1899-00.....	7	6	86	5	4	80	...	...	...	12	10	83
1900-01.....	5	5	100	5	5	100	...	...	...	10	10	100
1901-02.....	30	26	87	10	9	90	...	...	...	40	35	88
1902-03.....	31	22	71	8	8	100	...	...	...	39	30	77
1903-04.....	43	37	86	18	13	72	...	...	...	61	50	82
1904-05.....	57	42	74	23	20	87	1	0	...	81	62	77
1905-06.....	36	25	70	27	19	70	4	0	...	67	44	66
1906-07.....	20	15	75	10	15	75	1	0	...	41	30	73
1907-08.....	132	67	51	28	21	75	1	0	...	161	88	55
1908-09.....	224	88	39	52	27	52	3	1	33	279	116	42
1909-10.....	289	97	34	72	37	51	1	0	...	362	134	37
1910-11.....	186	64	34	69	38	55	2	1	50	257	103	40
1911-12.....	195	57	29	71	48	68	2	0	...	268	105	39
1912-13.....	187	56	30	83	44	53	1	0	...	271	100	37
1913 14.....	201	60	30	82	37	45	4	1	25	287	98	34

## APPENDICES.

The following schedules and statements are appended:—

No. 1. Schedule of surveyors employed and work executed by them from April 1, 1913, to March 31, 1914.

No. 2. Schedule showing for each surveyor employed from April 1, 1913, to March 31, 1914, the number of miles surveyed of township section lines, township outlines, traverses of lakes and rivers and resurvey; also the cost of the same.



## SESSIONAL PAPER No. 25b

No. 3. List of lots in the Yukon Territory, surveys of which have been received from April 1, 1913 to March 31, 1914.

No. 4. List of miscellaneous surveys in the Yukon Territory, returns of which have been received from April 1, 1913, to March 31, 1914.

No. 5. Statement of work executed in the Topographical Surveys Branch.

No. 6. List of new editions of sectional maps issued from April 1, 1913, to March 31, 1914.

No. 7. Statement of work executed in the photographic office from April 1, 1913, to March 31, 1914.

No. 8. Statement of work executed in the lithographic office from April 1, 1913, to March 31, 1914.

No. 9. List of Employees of the Topographical Surveys Branch at Ottawa, on April 1, 1914, with the name, classification, duties of office and salary of each.

No. 10. List of Dominion Land Surveyors who are in possession of standard measures.

Nos. 11 to 57. Reports of surveyors employed.

No. 58. Results of observations for magnetic declination.

No. 59. Results of watch trials.

## MAPS AND PROFILES.

The following maps and profiles accompany this report:—

Map showing surveys to March 31, 1914.

Maps to accompany reports of surveyors.

Profiles of meridians and base lines.

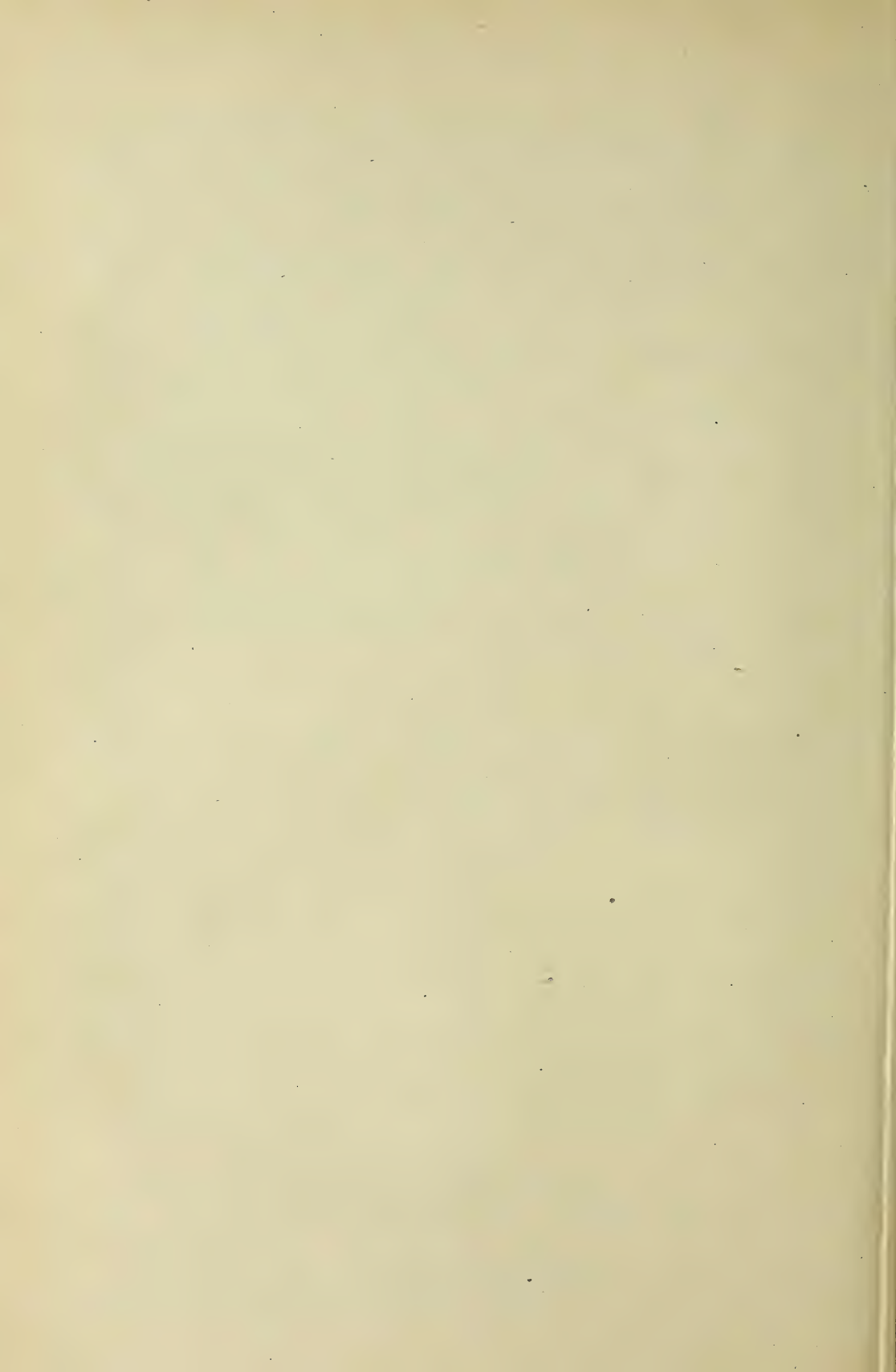
I have the honour to be, sir,

Your obedient servant,

E. DEVILLE,

*Surveyor General.*







# TOPOGRAPHICAL SURVEYS BRANCH

## SCHEDULES AND STATEMENTS

### APPENDIX No. 1.

SCHEDULE of Surveyors employed and work executed by them from April 1, 1913, to March 31, 1914.

Surveyor.	Address.	Description of Work.
Akins, J. R. . . . .	Ottawa, Ont. . . . .	Survey of the east outlines of townships 89 to 92, range 22, the twenty-fourth and twenty-fifth base lines across ranges 18 to 21, the twenty-sixth base line across ranges 18 to 20, and the twenty-seventh base line across ranges 10 to 18 and part of range 9, all west of the fifth meridian.
Allison, C. B. . . . .	South Woodslee, Ont..	Contract No. 25 of 1913. Subdivision of townships 33, ranges 11 and 12, and the south two-thirds of townships 34, ranges 11, 12 and 13, west of the principal meridian.
Aylsworth, C. F. . . . .	Madoc, Ont. . . . .	Resurvey in township 16, range 6, east of the principal meridian; townships 20 and 21, range 3, townships 21 and 22, range 4, and township 23, range 5, west of the principal meridian.
Baker, J. C. . . . .	Kingston, Ont. . . . .	Contract No. 20 of 1913. Subdivision of townships 57, 58, 59 and 60, range 15, and the north two-thirds of township 60, range 14, west of the third meridian.
Bélanger, P. R. A. . . . .	Ottawa, Ont. . . . .	Inspection of contracts Nos. 19, 22, 23, 28, 31 and 32 of 1912 and No. 20 of 1913. Subdivision in townships 54 and 55, range 12, west of the third meridian.
Bennett, G. A. . . . .	Tillsonburg, Ont. . . . .	Correction surveys in townships 10 and 11, range 13, townships 10, ranges 14 and 16, east of the principal meridian; townships 17 and 18, range 20, and townships 20, ranges 21 and 22, west of the principal meridian; township 19a, range 1, township 11, range 6, township 19, range 8, township 7, range 10, townships 19 and 20, range 12, townships 3 and 4, range 18, and township 16, range 30, west of the second meridian; townships 15 and 16, range 2, township 13, range 5, and township 18, range 18, west of the third meridian; township 2, range 19, west of the fourth meridian. Subdivision surveys in townships 18 and 19, range 1, townships 23, ranges 15 and 16, west of the third meridian; township 17, range 5, township 9, range 16, townships 1, ranges 28 and 29, west of the fourth meridian; township 19, range 4, west of the fifth meridian. Retracement



APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1913, to March 31, 1914—*Continued.*

Surveyor.	Address.	Description of Work.
		surveys in township 10, range 8, township 20, range 12, west of the second meridian; township 23, range 9, west of the third meridian; townships 18 and 19, ranges 9, 10 and 11, and townships 1 and 2, ranges 12 and 25, west of the fourth meridian. Resurvey in township 21, range 11, west of the principal meridian; township 24, range 5, townships 25, ranges 5 and 6, and township 22, range 9, west of the third meridian. Traverse in township 10, range 15, east of the principal meridian; township 25, range 9, west of the principal meridian; township 10, range 8, west of the second meridian; townships 25, ranges 5, 6 and 9, township 23, range 15, west of the third meridian; township 17, range 5, and township 2, range 25, west of the fourth meridian; township 24, range 1, west of the fifth meridian. Investigation in township 25, range 9, west of the third meridian.
Blanchet, G. H.	Ottawa, Ont.	Survey of the twenty-second base line from the fourth to the fifth meridian.
Boivin, E.	Chicoutimi, Que.	Resurvey in township 42, range 23, west of the fourth meridian. Retracement survey in township 53, range 27, west of the fourth meridian. Correction survey in township 49, range 14, west of the fifth meridian.
Boulton, W. J.	Mattawa, Ont.	Subdivision in township 3, range 30, west of the fourth meridian; townships 4 and 12, range 1, townships 8, 11, 14 and 15, range 2, townships 8, 10, 13, 14, 15 and 16, range 3, townships 8 and 16, range 4, and township 8, range 5, west of the fifth meridian.
Bowman, E. P.	West Montrose, Ont.	Investigation and traverse of lakes in township 34, range 11, townships 31, 32 and 34, range 12, townships 29, 30, 31, 33, 34, 35 and 36, range 13, townships 31, 33, 34, 35, 36 and 37, range 14, townships 30, 31, 32, 33, 34, 35, 36, and 37, range 15, townships 31, 32 and 33, range 16, townships 27, 28, 30, 32, 33, 34, 35, 36, 37, 38 and 39, range 18, townships 28, 29, 30, 32, 33, 35, 36, 37, 39, 40 and 41, range 19, townships 29, 30, 31, 34, 35, 36, 37, 38, 39, 40 and 41, range 20, townships 30, 31, 33, 35, 39 and 47, range 21, and townships 47 and 48, range 22, west of the third meridian.
Brenot, L.	Ottawa, Ont.	Survey of the east outlines of townships 81, 82, 83 and 84, range 17, townships 81, 82 and 83, range 18, and townships 81, 82 and part of 83, range 19, west of the sixth meridian. Subdivision in townships 83 and 84, range 20, township 84, range 21, township 83, range 22, and township 82, range 25, west of the sixth meridian. Survey of timber berth No. 2052 in townships 80 and 81, ranges 15 and 16, west of the sixth meridian. Mounding in township 79, range 14, west of the sixth meridian.
Bridgland, M. P.	Calgary, Alta.	Photo-topographical survey of the northern part of the Crowsnest Forest Reserve.



SESSIONAL PAPER No. 25b

APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1913, to March 31, 1914—*Continued.*

Surveyor.	Address.	Description of Work.
Brown, C. D. . . . .	Winnipeg, Man. . . . .	Contract No. 19 of 1913. Subdivision of townships 79, 80 and westerly half of township 78, range 22, townships 78, 79 and 80, range 23, west of the fifth meridian.
Buchanan, J. A. . . . .	Edmonton, Alta. . . . .	Contract No. 1 of 1913. Subdivision of townships 85 and 86, ranges 5 and 6, townships 86 and 87, ranges 7 and 8, west of the sixth meridian.
Calder, J. A. . . . .	Lytton, B.C. . . . .	Subdivision in townships 15, 16 and 17, ranges 24 and 25, township 15, range 26, townships 15, 16, 17 and 18, range 27, and townships 17 and 18, range 28, west of the sixth meridian. Resurvey in townships 15 and 16, range 25, and township 18, range 27, west of the sixth meridian. Traverse in townships 15, 16 and 17, ranges 24 and 25, township 15, range 26, townships 16, 17 and 18 range 27, and township 18, range 28, west of the sixth meridian.
Chase, A. V. . . . .	Orillia, Ont. . . . .	Subdivision in townships 12, 13 and 14, range 26, townships 12, 13, 14 and 15, range 27, and township 12, range 28, west of the sixth meridian. Resurvey in townships 12 and 13, range 26, and townships 13 and 14, range 27, west of the sixth meridian. Traverse in townships 12 and 13, range 26, townships 12, 13 and 14, range 27, and township 12, range 28, west of the sixth meridian.
Christie, Wm. . . . .	Prince Albert, Sask. . . . .	Contract No. 22 of 1913. Subdivision of townships 57, ranges 1, 2, 3, 4 and 5, west of the third meridian.
Coltham, G. W. . . . .	Aurora, Ont. . . . .	Investigation and traverse of lakes in townships 50 and 52, range 9, townships 49, 50, 51 and 52, range 10, townships 47, 49, 50, 51 and 52, range 11, townships 47, 48, 49, 50, 51 and 52, range 12, townships 47, 48, 51 and 52, range 13, west of the fourth meridian.
Cowper, G. C. . . . .	Welland, Ont. . . . .	Investigation and traverse of lakes in townships 14 and 15, range 19, townships 12, 14 and 15, range 20, townships 12, 13, 14, 15 and 16, range 21, townships 12, 13, 14, 15, 16 and 17, range 22, townships 12, 13, 14, 16 and 17, range 23, townships 12, 13, 14, 15 and 16, range 24, townships 13, 14, 15, 16 and 17, range 25, townships 12, 13, 14 and 16, range 26, township 14, range 27, all west of the third meridian; townships 12, 13, 15, 16 and 17, range 1, townships 1, 8, 13, 14, 16 and 17, range 2, townships 1, 8, 9, 13, 14, 15 and 19, range 3, townships 1, 9, 18, 19 and 20, range 4, townships 8, 14, 15, 17, 18 and 19, range 5, townships 9, 10, 15 and 18, range 6, townships 3, 4, 5, 18, 20 and 21, range 7, townships 3, 4, 5, 9, 15, 18, 20, 21 and 22, range 8, townships 3, 5, 16, 20 and 21, range 9, townships 18, 19 and 21, range 10, townships 9, 10, 15, 16 and 18, range 11, townships 9 10 and 19, range 12, townships 5, 9, and 10, range 13, townships 5 and 9, range 14, west of the fourth meridian.



APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1913, to March 31, 1914—*Continued.*

Surveyor.	Address.	Description of Work.
Cumming, A. L. . . . .	Cornwall, Ont. . . . .	Survey of the boundaries of the townsite of Nordegg in township 40, range 15, west of the fifth meridian. Resurveys in township 45, range 23, west of the third meridian, and townships 26 and 27, range 15, townships 50 and 51, range 27, west of the fourth meridian. Correction surveys in township 48, range 22, west of the third meridian; township 65, range 5, townships 58 and 59, range 6, township 55, range 8, and township 50, range 12, west of the fourth meridian. Investigation and traverse of lakes in township 48, range 22, townships 44, 45 and 46, range 23, west of the third meridian; township 55, range 8, township 69, range 10, township 68, range 16, township 38, range 28, west of the fourth meridian; township 38, range 1, townships 51, 52, 53 and 55, range 2, and township 52, range 3, west of the fifth meridian. Survey of timber berth No. 2066 in township 64, range 27, west of the fourth meridian.
Davies, T. A. . . . .	Edmonton, Alta. . . . .	Contract No. 15 of 1913. Subdivision of townships 70, 71 and 72, ranges 18 and 19, west of the fourth meridian.
Day, H. S. . . . .	Edmonton, Alta. . . . .	Contract No. 16 of 1913. Subdivision of townships 73, 74, 75 and 76, range 18, west of the fourth meridian.
Deans, W. J. . . . .	Brandon, Man. . . . .	Inspection of contract No. 7 of 1911 and No. 23 of 1913. Survey of the 212 foot contour line at Point du Bois falls on Winnipeg river in township 15, range 14, and townships 14 and 16, range 15, east of the principal meridian. Subdivision in townships 45 and 46, range 9, townships 47 and 48, range 10, and townships 14 and 15, range 27, west of the second meridian. Correction survey in township 14, range 29, west of the second meridian. Traverse in township 16, range 14, east of the principal meridian, and township 1, range 20, west of the principal meridian.
Evans, S. L. . . . .	Corinth, Ont. . . . .	Subdivision in township 17, range 3, townships 16, 17, 18, 19 and 20, range 4, township 23, range 5, and township 19, range 7, west of the fifth meridian. Survey of summer resort lots in township 19, range 19, and township 30, range 30, west of the principal meridian. Traverse in township 19, range 19, townships 26 and 27, range 30, west of the principal meridian; township 17, range 4, west of the fifth meridian.
Fawcett, A. . . . .	Gravenhurst, Ont. . . . .	Contract No. 17 of 1913. Subdivision of township 77, range 18, and townships 75, 76 and 77, range 19, west of the fourth meridian. Survey of east outline of township 74, range 20, west of the fourth meridian.
Fawcett, S. D. . . . .	Ottawa, Ont. . . . .	Settlement surveys at Fort Resolution on Slave river and at Fort Simpson, Fort Wrigley, Fort Norman and Fort Good Hope on McKenzie river.



## SESSIONAL PAPER No. 25b

APPENDIX No. 1—*Continued.*SCHEDULE of Surveyors employed and work executed by them from April 1, 1913, to March 31, 1914—*Continued.*

Surveyor.	Address.	Description of Work.
Fletcher, J. A. . . . .	Ottawa, Ont. . . . .	Survey of the east outlines of townships 89 to 108, range 18, the twenty-seventh base line across ranges 19 to 21 and the east half of range 22 and the twenty-eighth base line across range 18, west of the fifth meridian.
Fontaine, L. E. . . . .	Lévis, Que. . . . .	Inspection of contracts Nos. 1, 2 and 3 of 1913. Subdivision in township 84, range 21, and township 83, range 22, west of the fifth meridian; township 71, range 5, townships 71, 72, 78 and 79, range 6, townships 79 and 80, range 7, west of the sixth meridian. Traverse in township 85, range 21, west of the fifth meridian.
Francis, John. . . . .	Portage la Prairie, Man. . . . .	Contract No. 28 of 1913. Subdivision of part of township 17 and southerly two-thirds of township 18, range 12, southerly two-thirds of township 18, range 13, township 17 and southerly two-thirds of township 18, range 14, and west half of township 17, range 15, east of the principal meridian.
Galletly, J. S. . . . .	Oshawa, Ont. . . . .	Subdivision in townships 109 and 110, ranges 3 and 4, township 108, range 6, townships 108 and 109, range 11, township 108, range 12, and township 109, range 13, west of the fifth meridian. Survey of the east outline of township 109, range 17, part of the east outline of township 107, range 16, the north outlines of townships 107, ranges 11, 12, 13 and 14, west of the fifth meridian. Traverse in townships 109 and 110, range 3, townships 108, 109 and 110, range 4, township 108, range 6, townships 108, ranges 11 and 12, township 109, range 13, townships 108 and 109, range 14, and township 109, range 15, west of the fifth meridian.
Gibbon, Jas. . . . .	Vancouver, B.C. . . . .	Contract No. 18 of 1913. Subdivision of townships 60, ranges 10, 11 and 13, and townships 58 and 59, range 14, west of the fifth meridian. Survey of the east boundary of township 60, range 15, west of the fifth meridian.
Green, T. D. . . . .	Ottawa, Ont. . . . .	Contract No. 14 of 1913. Subdivision of townships 70 and 71, range 23, and townships 69 and 70, range 24, west of the fourth meridian.
Herriot, G. H. . . . .	Ottawa, Ont. . . . .	Survey of the eighteenth base line across ranges 1 to 16 and the nineteenth base line across ranges 1 to 6 and part of 7, west of the principal meridian.
Hunter, A. E. . . . .	Warton, Ont. . . . .	Subdivision in township 8, range 25, and townships 8, 9 and 10, range 26, west of the sixth meridian. Resurvey in townships 7, 8, 9 and 10, range 26, west of the sixth meridian. Traverse in township 8, range 25, and townships 8, 9 and 10, range 26, west of the sixth meridian.



APPENDIX No. 1—*Continued.*SCHEDULE of Surveyors employed and work executed by them from April 1, 1913, to March 31, 1914—*Continued.*

Surveyor.	Address.	Description of Work.
Jackson, J. E.. . .	Hamilton, Ont.. . .	Contracts No. 23 and 24 of 1913. Subdivision of townships 38, 39, 40 and 41, range 24, and part of township 41, range 25, west of the principal meridian. Partial subdivision of townships 40, 41 and 42, range 18, townships 38, 39, 40 and 41, range 19, townships 39, 40 and the northerly third of township 38, range 20, west of the principal meridian.
Johnston, C. E.. . .	Toronto, Ont. . . .	Investigation and traverse of lakes in townships 15, 16, 17, 18, 19, 20, 21 and 22, range 2, townships 15, 16, 17, 18, 19, 20, 21 and 22, range 3, townships 15, 16, 17, 18 and 19, ranges 4 and 5 townships 15, 16, 17, 18, 19 and 20, range 6, townships 15, 16, 17, 18, 19, 24, 25 and 26, range 7, townships 24, 25, 26, 27 and 28, ranges 8 and 9, townships 25, 26, 27 and 28, ranges 10 and 11, all west of the third meridian.
Johnston, J. H.. . .	Edmonton, Alta. . . .	Contract No. 7 of 1913. Subdivision of parts of townships 72, ranges 4 and 5, townships 72 and 73, range 6, part of township 73, range 7, township 74 and part of townships 72 and 73, range 8, townships 72, 73, 74 and parts of townships 71 and 72, range 9, and township 72 and part of township 71, range 10, west of the fifth meridian.
Johnston, W. J.. . .	St. Catharines, Ont. . . .	Subdivision in townships 5, 6, 7 and 8, range 26, townships 4 and 5, range 27, townships 3, 4 and 5, range 28, west of the sixth meridian; townships 4 and 5, range 5, west of the seventh meridian. Resurvey in townships 5, 6, 7 and 8, range 26, townships 4 and 5, range 27, and township 4, range 28, west of the sixth meridian. Traverse in townships 5, 6 and 7, range 26, township 4, range 27, and townships 3 and 4, range 28, west of the sixth meridian; township 4, range 5, west of the seventh meridian.
Lighthall, A.. . . .	Vancouver, B.C.. . .	Contract No. 26 of 1913. Subdivision of townships 24 and 25, ranges 8 and 9, and the southerly two-thirds of township 26, range 9, east of the principal meridian.
Lonergan, G. J.. . .	Buckingham, Que. . . .	Inspection of contracts Nos. 14, 15 and 37 of 1912, and 5, 6, 7, 8, 9, 10 and 18 of 1913. Traverse in township 75, range 14, west of the fifth meridian. Survey of Lesser Slave Lake and Wabiskaw settlements.
MacLeod, G. W.. . .	Edmonton, Alta. . . .	Contract No. 3 of 1913. Subdivision of township 72 and northerly two-thirds of township 71, range 1, east half of northerly two-thirds of township 71 and east half of township 72, range 2, township 73, northerly two-thirds of township 70 and southerly third of township 71, range 4, northerly two-thirds of township 70 and southerly third of township 71, ranges 5 and 6, township 69, range 9, township 69 and southerly two-thirds of township 70, range 10, west of the sixth meridian.



## SESSIONAL PAPER No. 25b

APPENDIX No. 1—*Continued.*SCHEDULE of Surveyors employed and work executed by them from April 1, 1913, to March 31, 1914—*Continued.*

Surveyor.	Address.	Description of Work.
Martindale, E. S.	..Kingsmill, Ont.	Survey of the fifteenth base line across ranges 22 to 27 and the sixteenth base line across ranges 14 to 27, west of the second meridian.
Matheson, H.	..Ottawa, Ont.	Surveys along the Canadian Northern railway in townships 47 and 48, ranges 17 and 18, west of the fifth meridian. Survey of Fitzhugh townsite, villa lots at Pyramid and Patricia lakes and corrals at Jasper in township 45, range 1, west of the sixth meridian. Correction survey in Lake St. Anne settlement in township 54, range 3, west of the fifth meridian. Topographical survey in Jasper Forest Park in townships 44 and 45, range 1, and township 45, range 2, west of the sixth meridian. Traverse of road from Jasper to Pyramid and Patricia lakes, and traverse of Pyramid and Patricia lakes in township 45, range 1, west of the sixth meridian.
McFarlane, J. B.	..Toronto, Ont.	Survey of the twenty-fourth base line across ranges 7 to 11 and part of range 6, and the twenty-fifth base line across ranges 1 to 12, west of the fourth meridian.
McGrandle, H.	..Wetaskiwin, Alta.	Contract No. 11 of 1913. Subdivision of townships 69 and 70, ranges 25, 26 and 27, west of the fourth meridian.
McKay, R. B.	..Vancouver, B.C.	Subdivision in townships 1, ranges 28 and 29, west of the sixth meridian; townships 17, 19, 21, 22 and 25 east of the coast meridian; township 39 west of the coast meridian. Resurvey in townships 1, ranges 28 and 29, west of the sixth meridian; townships 14, 17, 19, 21, 22, 23, 25 and 40 east of the coast meridian; and township 39 west of the coast meridian. Traverse in townships 1, ranges 28 and 29, and township 3, range 30, west of the sixth meridian; townships 22, 23 and 24 east of the coast meridian; and township 39 west of the coast meridian.
Miles, C. F.	..Toronto, Ont.	Inspection of contracts Nos. 13 and 33 of 1912, and 11, 12, 13, 14, 15, 16 and 17 of 1913. Traverse in township 73, range 19, west of the fourth meridian. Subdivision in townships 45, ranges 9 and 10, west of the second meridian; township 70, range 18, and township 73, range 19, west of the fourth meridian.
Narraway, A. M.	..Ottawa, Ont.	Retracement surveys in townships 6 and 7, range 30, west of the third meridian; townships 5 and 6, ranges 3, 4 and 5, township 6, range 6, townships 1 and 2, ranges 9 and 10, and township 21, range 10, west of the fourth meridian. Resurveys in townships 18 and 19, range 9, townships 18, 19, 20 and 21, range 10, township 21, range 11, townships 21 and 22, range 12, and townships 2 and 3, ranges 14 and 15, west of the fourth meridian. Subdivision surveys in townships 18 and 19, range 10, township 21, range 11, and townships 21 and 22, range 12, west of the fourth meridian. Traverse in townships 8, ranges 22 and 23, township 10, range 24, townships 9 and 10, range 25, and township 9, range 26, west of the fourth meridian.



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APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1913, to March 31, 1914—*Continued.*

Surveyor.	Address.	Description of Work.
Neelands, R. . . . .	Hamiota, Man. . . . .	Investigation and traverse of lakes in townships 39 and 40, range 17, townships 39, 40 and 41, range 18, townships 38, 39, 41, 42, 44, 45 and 45a, range 22, townships 38, 39, 40, 41, 42 and 44, range 23, townships 38, 39, 40, 41, 42, 43 and 44, range 24, townships 38, 39, 40, 41, 42 and 43, range 25, townships 39, 40, 41 and 49, range 26, townships 46 and 49 range 27, township 46, range 28, west of the second meridian; township 46, range 1, west of the third meridian.
Neville, E. A. . . . .	Vancouver, B.C. . . . .	Contract No. 6 of 1913. Subdivision of townships 72, 73 and part of township 71, range 11, townships 72, 73 and 74, range 12, townships 73, ranges 13, 14 and 15, west of the fifth meridian.
Palmer, P. E. . . . .	Dorchester, N.B. . . . .	Subdivision in township 52, range 29, townships 50 and 51, range 30, township 50, range 31, and townships 49 and 50, range 32, west of the principal meridian; townships 48, 49 and 50, range 1, townships 47 and 48, range 2, and townships 46 and 47, range 3, west of the second meridian. Survey of the east outlines of township 49, range 30, and townships 49, 51 and 52, range 31, west of the principal meridian; townships 46, 49 and part of township 45, range 2, township 48, range 3, and townships 47 and 48, range 4, west of the second meridian. Retracement of the east outlines of townships 45 and 46, range 3, west of the second meridian. Survey of the north outlines of township 49, range 31, west of the principal meridian, and of township 47, range 1, west of the second meridian.
Pearson, H. E. . . . .	Edmonton, Alta. . . . .	Contract No. 12 of 1913. Subdivision of townships 71 and 72 and part of township 73, range 26, west of the fourth meridian; township 72 and parts of townships 70, 71 and 73, range 1, and part of township 70, range 2, west of the fifth meridian. Survey of part of east outline of township 70, range 27, west of the fourth meridian.
Pierce, J. W. . . . .	Ottawa, Ont. . . . .	Contract No. 21 of 1913. Subdivision of townships 57 and 58, range 13, townships 57 and 58 and the southerly two-thirds of township 59, range 14, west of the third meridian. Survey of the east outlines of townships 59 and 60, range 13, and of township 60, range 14, west of the third meridian.
Pinder, Geo. Z. . . . .	Edmonton, Alta. . . . .	Contract No. 10 of 1913. Subdivision of townships 67, 68 and 69, range 1, the northerly two-thirds of township 67 and parts of townships 68 and 69, range 2, west of the fifth meridian.
Plunkett, T. H. . . . .	Ottawa, Ont. . . . .	Survey of the thirteenth base line from the northeast corner of township 48, range 28, west of the principal meridian easterly to the western shore of lake Winnipeg, and the fourteenth base line from the northeast corner of township 52, range 28, easterly to the western shore of lake Winnipeg.



## SESSIONAL PAPER No. 25b

APPENDIX No. 1—*Continued.*SCHEDULE of Surveyors employed and work executed by them from April 1, 1913, to March 31, 1914—*Continued.*

Surveyor.	Address.	Description of Work.
Pónton, A. W. . . . .	Edmonton, Alta. . . . .	Contract No. 5 of 1913. Subdivision of townships 76, ranges 7, 8, 9 and 10 and parts of townships 75, ranges 7, 8 and 9, west of the fifth meridian.
Purser, R. C. . . . .	Windsor, Ont. . . . .	Subdivision in township 33, range 6, township 39, range 19, and township 34, range 25, west of the third meridian. Resurveys in township 29, range 15, west of the principal meridian; township 27, range 24, west of the second meridian; township 42, range 6, and township 26, range 12, west of the third meridian. Correction surveys in township 47, range 14, township 42, range 16, and township 33, range 28, west of the second meridian, and township 51, range 27, west of the third meridian. Retracement in township 33, range 31, west of the principal meridian; township 26, range 11, township 42, range 16, and township 25, range 27, west of the second meridian; township 30, range 3, township 47, range 4, townships 47, 48 and 55, range 5, township 29, range 17, townships 40, ranges 23 and 24, and township 51, range 27, west of the third meridian, and township 34, range 21, west of the fourth meridian. Traverse in township 29, range 15, and township 33, range 31, west of the principal meridian; townships 25, ranges 4 and 5, township 33, range 10, townships 26 and 33, range 11, and township 33, range 12, west of the second meridian; township 37, range 1, township 33, range 6, township 53, range 7, township 50, range 23, and township 34, range 25, west of the third meridian. Investigation in township 29, range 17, west of the second meridian; township 45, range 23, and township 51, range 27, west of the third meridian; and township 33, range 10, west of the fourth meridian.
Rinfret, C. . . . .	Montreal, Que. . . . .	Investigation and traverse of lakes in townships 4, 5 and 7, range 19, townships 2, 3, 4, 5, 7 and 8, range 20, townships 2, 3, 4, 5, 6, 7, 8 and 9, range 21, townships 2, 3, 4, 5, 6, 7 and 8, range 22, townships 2, 3, 4, 5, 6 and 7, range 23, townships 4, 5, 6 and 7, range 24, townships 3, 4, 5, 6 and 7, ranges 25 and 26, townships 3, 4, 5 and 6, range 27, townships 4, 5 and 6, range 28, townships 3, 4, 6 and 9, range 29, and townships 3, 4, 5 and 6, range 30, west of the second meridian. Retracement surveys in township 2, range 21, and township 6, range 25, west of the second meridian.
Robinson, E. W. . . . .	Ottawa, Ont. . . . .	Production of the second meridian from the northeast corner of township 78 to the quarter section post on the east boundary of section 13, township 85.
Rolfson, O. . . . .	Walkerville, Ont. . . . .	Survey of the sixteenth base line across ranges 26 to 31, and the seventeenth base line across ranges 6 to 20, west of the principal meridian.



APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1913, to March 31, 1914—*Continued.*

Surveyor.	Address.	Description of Work.
Roy, G. P. J. . . . .	Quebec, Que. . . . .	Subdivision surveys of the parts of township 41, range 13, township 37, range 3, township 37, range 4, and township 39, range 9, west of the second meridian; and townships 36, ranges 30 and 31, west of the principal meridian not included in the Porcupine Forest Reserve. Survey of timber berth No. 2055, blocks 1 and 2 in townships 42 and 43, range 11, west of the second meridian. Retracement of part of the north outline of township 35, range 31, west of the principal meridian, north outlines of townships 36, ranges 3 and 4, and part of the east outline of township 37, range 5, west of the second meridian. Traverse in township 37, range 4, west of the second meridian.
Saint Cyr, A. . . . .	Ottawa, Ont. . . . .	Survey of the third meridian from the eighteenth to the nineteenth base line, and the nineteenth base line across ranges 1 to 17, west of the third meridian.
Saint Cyr, J. B. . . . .	Montreal, Que. . . . .	Investigation and traverse of lakes in townships 32 and 33, range 14, township 32, range 15, townships 34 and 35, range 16, townships 34, 35, 36, 37 and 38, range 17, townships 34, 35, 36, 37 and 38, range 18, townships 35, 36, 37, 38 and 39, range 19, townships 31, 34, 37 and 38, range 20, townships 29, 38 and 39, range 21, townships 35, 36, 37, 38, 39 and 40, range 22, townships 34, 35, 36, 37, 38, 39 and 40, range 23, townships 35, 36 and 37, range 24, townships 35, 37 and 41, range 25, townships 36, 37, 40 and 41, range 26, townships 34, 36, 39 and 40, range 27, townships 36, 37, 39, 40, 41 and 42, range 28, west of the fourth meridian; townships 40, 41, 42 and 43, range 1, west of the fifth meridian.
Segré, B. H. . . . .	Toronto, Ont. . . . .	Investigation and traverse of lakes in township 25, range 18, townships 23, 24, 25 and 26, range 19, townships 20 and 25, range 20 townships 20, 21, 25 and 26, range 21, townships 17, 18, 20, 21, 24, 25 and 26, range 22, townships 17, 18, 20, 21, 22, 23, 24, 25, 26 and 28, range 23, townships 18, 22, 23, 24, 25, 26, 27 and 28, range 24, townships 17, 18, 19, 25, 26, 27 and 28, range 25, townships 19, 20, 21 and 22, range 26, townships 22, 23, 25 and 26, range 27, and township 18, range 30, west of the second meridian; township 18, range 1, west of the third meridian.
Seibert, F. V. . . . .	Edmonton, Alta. . . . .	Survey of the twenty-first base line from the fourth to the fifth meridian. Retracement of the east outline of section 36, township 80, range 1, west of the fourth meridian.
Steele, I. J. . . . .	Ottawa, Ont. . . . .	Contract No. 4 of 1913. Subdivision of townships 76, ranges 11, 12 and 13 and parts of townships 75, ranges 10, 11, 12 and 13, west of the fifth meridian.



SESSIONAL PAPER No. 25b

APPENDIX No. 1—*Continued.*SCHEDULE of Surveyors employed and work executed by them from April 1, 1913, to March 31, 1914—*Continued.*

Surveyor.	Address.	Description of Work.
Stewart, N. C. . . . .	Ottawa, Ont. . . . .	Subdivision of townships 23 and 24, range 17, and township 23, range 18, west of the fifth meridian; townships 23, ranges 2, 3, 4, 5 and 6, township 18, range 8, township 20, range 9, townships 18 and 21, ranges 10 and 11, townships 21 and 25, range 12, townships 24 and 25, range 13, and township 25, range 14, west of the sixth meridian. Resurvey in township 23, range 18, west of the fifth meridian; township 23, range 1, townships 22 and 23, range 2, townships 23, ranges 4 and 5, townships 19 and 20, range 9, townships 18 and 21, range 10, township 21, range 11, townships 21 and 25, range 12, and townships 25, ranges 13 and 14, west of the sixth meridian. Traverse in townships 22 and 23, range 2, townships 23, ranges 3, 4 and 5, township 21, range 11, township 25, range 12, township 24, range 13, and township 25, range 14, west of the sixth meridian.
Stock, J. J. . . . .	Ottawa, Ont. . . . .	Contract No. 8 of 1913. Subdivision of township 66 and parts of townships 67 and 68, range 3, townships 65, 66 and part of township 67, range 4, and township 65 and southerly half of township 66, range 5, west of the fifth meridian. Survey of timber berth No. 1935 in township 62, range 4, and townships 60 and 61, range 5, and timber berth No. 1918 in township 59, range 12, west of the fifth meridian.
Street, P. B. . . . .	Toronto, Ont. . . . .	Subdivision in township 61, range 20, township 60 and 61, range 21, townships 59 and 60, range 22, townships 58 and 59, range 23, townships 57 and 58, range 24, township 54, range 26, and townships 53 and 54, range 27, west of the principal meridian. Traverse in township 61, range 20, township 60, range 21, townships 59 and 60, range 22, townships 59, range 23, township 58, range 24, township 54, range 26, township 53, range 27, and township 54, range 27, west of the principal meridian.
Stuart, A. G. . . . .	Buckingham, Que. . . . .	Retracement of the second base line from the principal to the second meridian, the east boundary of range 31 from the international boundary to the northeast corner of township 24, and the fifth, sixth and seventh base lines across ranges 31 to 33, west of the principal meridian; the third base line across ranges 1 to 7 and the east boundary of range 7 from the northeast corner of township 8 to the northeast corner of township 16, east of the principal meridian.
Taggart, C. H. . . . .	Kamloops, B.C. . . . .	Subdivision in townships 16 and 17, range 13, townships 18 and 19, ranges 14 and 15, township 21, range 18, township 20 and 21, range 19, townships 21, ranges 20 and 21, township 22, range 22, townships 21 and 22, range 23, townships 18, 19 and 21, range 24, townships 18, 19, 20, 21 and 22, range 25, townships 19, 20 and 21, range 26, and township 20, range



5 GEORGE V., A. 1915

APPENDIX No. 1—*Continued.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1913, to March 31, 1914—*Continued.*

Surveyor.	Address.	Description of Work.
		27, west of the sixth meridian. Resurvey in townships 18 and 19, range 15, townships 21, ranges 18, 19, 20 and 21, township 22, range 22, townships 17, 18, 19, 20 and 21, range 24, townships 18, 19 and 21, range 25, and townships 20, ranges 26 and 27, west of the sixth meridian. Traverse in township 19, range 15, townships 21, ranges 18 and 21, townships 22, ranges 22 and 23, townships 17, 18, 19, 20 and 21, range 24, townships 18, 19, 20 and 21, range 25, and township 21, range 26, west of the sixth meridian.
Taylor, W. E.	Toronto, Ont.	Contract No. 27 of 1913. Subdivision of townships 21, 22 and 23, range 9, and parts of townships 21, 22 and 23, range 8, east of the principal meridian.
Tipper, Geo. A.	Brantford, Ont.	Contract No. 2 of 1913. Subdivision of townships 85, 86 and 87, range 23, townships 86 and 87, ranges 24, 25 and 26, west of the fifth meridian. Survey of the east outlines of townships 88, ranges 23 and 24, and of townships 85 and 88, ranges 25 and 26, west of the fifth meridian.
Tremblay, A. J.	Edmonton, Alta.	Contract No. 13 of 1913. Subdivision of township 72, range 23, and townships 71 and 72 ranges 24 and 25, west of the fourth meridian. Survey of the east outlines of townships 70, ranges 24 and 26, west of the fourth meridian.
Waddell, W. H.	Edmonton, Alta.	Contract No. 9 of 1913. Subdivision of township 72 and part of townships 73 and 74, range 2, townships 73 and part of townships 74, ranges 3, 4 and 5, township 74 and part of townships 75 and 76, range 6, all west of the fifth meridian.
Walker, C. M.	Guelph, Ont.	Surveys of cemeteries at Banff and Bankhead Alberta and Field, B.C. Traverse, levels and supervision of the construction of roads in the neighbourhood of Banff. Survey of small parcels of land for leaseholds in township 25, range 12, township 28, range 18, and township 26, range 26, west of the fifth meridian. Survey of golf links and recreation grounds at Banff. Contour survey and a survey for the location of improvements in the villa lot section of Banff.
Wallace, J. N.	Calgary, Alta.	Levelling along Athabaska river from Athabaska to Lesser Slave lake; along Athabaska river down stream from Athabaska to the twentieth base line west of the fourth meridian; along the Canadian Pacific railway from Edmonton to Calgary; along the Canadian Northern railway from Edmonton to Lloydminster; along the Hudson Bay railway northeast from Hudson Bay Junction to the fifteenth base line west of the principal meridian; along the Canadian Northern railway east and south from Hudson Bay Junction to Swan River.



SESSIONAL PAPER No. 25b

APPENDIX No. 1—*Concluded.*

SCHEDULE of Surveyors employed and work executed by them from April 1, 1913, to March 31, 1914—*Concluded.*

Surveyor.	Address.	Description of Work.
Waugh, B. W. . . . .	Ottawa, Ont. . . . .	Production of the principal meridian from the northeast corner of section 24, township 72, to the northeast corner of township 80; the twenty-first base line across ranges 1 to 9 east of the principal meridian, and the twentieth base line across ranges 1 to 3, west of the principal meridian, and ranges 1 to 7, east of the principal meridian.

## APPENDIX No. 2.

SCHEDULE showing for each surveyor employed from April 1, 1913, to March 31, 1914, the number of miles surveyed of township section lines, township outlines, traverses of lakes and rivers and resurvey, also the cost of the same.

Surveyor.	Miles of section.	Miles of outline.	Miles of traverse.	Miles of resurvey.	Total mileage.	Total cost.	Cost per mile.	Day work or contract.
						\$	\$ cts.	
Akins, J. R. . . . .		147			147	23,377	159 03	Day.
Allison, C. B. . . . .	180	30	7		217	6,146	28 32	Contract.
Aylsworth, C. F. . . . .				195	195	10,533	54 02	Day.
Baker, J. C. . . . .	200	52	25		277	8,717	31 47	Contract.
Bennett, G. A. . . . .	16	4	54	158	232	5,267	22 70	Day.
Blanchet, G. H. . . . .		152		7	159	25,589	157 27	"
Boulton, W. J. . . . .	132	12	9	44	197	12,890	65 43	"
Bowman, E. P. . . . .			214		214	7,027	32 84	"
Brenot, L. . . . .	100	74	43		217	26,767	123 32	"
Brown, C. D. . . . .	227	58			285	9,060	31 68	Contract.
Buchanan, J. A. . . . .	339	185			524	17,601	33 59	"
Calder, J. A. . . . .	121		52	3	176	8,314	47 24	Day.
Chase, A. V. . . . .	42		56	8	106	8,346	78 74	"
Christie, Wm. . . . .	202	54	93		349	9,167	26 27	Contract.
Coltham, G. W. . . . .			373		373	7,281	19 52	Day.
Cowper, G. C. . . . .			425		425	5,489	12 92	"
Cumming, A. L. . . . .	1		77	122	200	8,754	43 77	"
Davies, T. A. . . . .	241	86	88		415	13,094	31 55	Contract.
Day, H. S. . . . .	168	60	74		302	8,887	29 43	"
Evans, S. L. . . . .	129	6	20	3	158	9,559	60 50	Day.
Fawcett, A. . . . .	168	72	28		268	8,182	30 53	Contract.
Fletcher, J. A. . . . .		152			152	24,542	161 46	Day.
Francis, J. . . . .	166	42	36		244	7,236	29 66	Contract.
Galletly, J. S. . . . .	181	87	119		337	15,755	40 71	Day.
Gibbon, Jas. . . . .	208	36	56		300	9,047	30 16	Contract.
Green, T. D. . . . .	168	36			204	6,789	33 28	"
Herriot, G. H. . . . .		133			133	19,549	146 98	Day.
Hunter, A. E. . . . .	44		57	3	104	8,240	79 23	"
Jackson, J. E. . . . .	385	127	215		727	18,018	24 78	Contract.
Johnston, C. E. . . . .			259		259	5,872	22 67	Day.
Johnston, J. H. . . . .	263	55	63		381	11,159	29 29	Contract.
Johnston, W. J. . . . .	52		55	2	109	9,779	89 72	Day.
Lighthall, A. . . . .	138	30	62		230	6,591	28 66	Contract.



5 GEORGE V., A. 1915

APPENDIX No. 2—*Concluded.*

SCHEDULE showing for each surveyor employed from April 1, 1913, to March 31, 1914, the number of miles surveyed, &c.—*Concluded.*

Surveyors.	Miles of sections.	Miles of outline.	Miles of traverse.	Miles of resurvey.	Total mileage	Total cost.	Cost per mile.	Day work or contract.
MacLeod, G. W.	427	52	123	16	618	17,574	33 93	Contract.
Martindale, E. S.		196			196	26,820	136 84	Day.
McFarlane, J. B.		105		1	106	23,132	218 23	"
McGrandle, Hugh	196	52	48		296	8,325	28 13	Contract.
McKay, R. B.	42		23	24	89	10,091	113 38	Day.
Narraway, A. M.	40		64	450	554	9,632	17 39	"
Neelands, R.			572		572	7,313	12 78	"
Neville, E. A.	261	12	33		306	9,366	30 61	Contract.
Palmer, P. E.	211	156	8	12	387	12,680	32 76	Day.
Pearson, H. E.	218	47	99		364	10,710	29 42	Contract.
Pierce, J. W.	190	72	74		336	9,127	27 16	"
Pinder, G. Z.	244	28	39		311	9,139	29 39	"
Plunkett, T. H.		211			211	20,592	97 59	Day.
Ponton, A. W.	206	54	14		274	8,783	32 05	Contract.
Purser, R. C.	2		46	43	92	7,053	76 66	Day.
Rinfret, C.			506		506	6,017	11 89	"
Rolfson, O.		117			117	25,093	214 47	"
Roy, G. P. J.	121		9	25	155	12,495	80 61	"
Saint Cyr, A.		126			126	26,394	209 48	"
Saint Cyr, J. B.			603		603	6,862	11 38	"
Segré, B. H.			407		407	6,745	16 57	"
Seibert, F. V.		153		1	154	26,022	168 97	"
Steele, I. J.	221	39	36		296	7,732	26 12	Contract.
Stewart, N. C.	84		32	9	125	10,220	81 76	Day.
Stock, J. J.	272	51	12		335	11,866	35 42	Contract.
Street, P. B.	196	70	61		327	13,094	39 95	Day.
Stuart, A. G.				490	490	8,704	17 76	"
Taggart, C. H.	189		35	13	237	10,772	45 45	"
Taylor, W. E.	139	28	53	3	223	6,041	27 09	Contract.
Tipper, G. A.	305	174	139		618	16,800	27 18	"
Tremblay, A. J.	206	80	69		355	11,113	31 30	"
Waddell, W. H.	276	83	83		442	12,437	28 14	"
Waugh, B. W.		164			164	29,636	180 70	Day.
Total	7,918	3,760	5,748	1,632	19,058	821,004		

## APPENDIX No. 3.

List of lots in the Yukon Territory, survey returns of which have been received from April 1, 1913, to March 31, 1914.

## GROUP 2.

Lot No.	Acres.	Surveyor.	Year of Survey.	Date of Approval.	Claimant.	Remarks.
348	100'00	F. H. Kitto	1913	Sept. 25, 1913	Patrick Roach	Surface.
351	160'00	"	1913	Mar. 20, 1914	Joseph Rousseau	"
357	40'00	"	1913	" 20, 1914	"	"
363	51'65	"	1912	July 28, 1913	Amanda Savory	Virgin mineral claim
364	30'23	"	1912	" 28, 1913	"	Virgin No. 2, M.C.
366	10'89	"	1913	Jan. 22, 1914	Lone Star Limited	Surface.



SESSIONAL PAPER No. 25b

APPENDIX No. 3—*Concluded.*

## GROUP 3.

21	160 00	F. H. Kitto.....	1914	Feb. 23, 1914...	V. E. Ferry.....	Surface.
24	51 65	".....	1913	Mar. 26, 1914...	Donald McKinnon, <i>et al.</i> ...	Lion, M. C.
25	51 31	".....	1913	" 26, 1914...	" ".....	Thistle, M.C.
26	51 31	".....	1913	" 26, 1914...	" ".....	Hidden Treasure, M.C.
29	40 27	".....	1913	" 26, 1914...	" ".....	Talisman, M.C.
30	160 00	".....	1913	Feb. 17, 1914...	Donald McKinnon.....	Surface.
31	51 63	".....	1913	Mar. 26, 1914...	Donald McKinnon, <i>et al.</i> ...	Argyle, M.C.
32	51 65	".....	1913	" 26, 1914...	" ".....	Drumkinnon, M.C.
33	51 52	".....	1913	" 26, 1914.	" ".....	Roseneath, M.C.

## GROUP 4.

9	160 00	F. H. Kitto.....	1913	Dec. 19, 1913....	Geo. Grenier.....	Surface.
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## GROUP 10.

34	141 70	F. H. Kitto.....	1913	Mar. 26, 1914....	M. H. Boulais & Jos. Viau.	War Eagle, M.C.
35	98 00	".....	1913	" 26, 1914....	" " Paul Guité	Bunker Hill, M.C.
36	36 00	".....	1913	" 26, 1914....	L. A. Herdt.....	Susie, M.C.
37	41 11	".....	1913	" 26, 1914....	Victor and Joseph Dupont.	Glenlivet, M.C.

## APPENDIX No. 4.

LIST of miscellaneous surveys in the Yukon Territory, returns of which have been received from April 1, 1913, to March 31, 1914.

Year.	Surveyor.	Description of Survey.
1912	F. H. Kitto.....	Base line on part of Tenmile creek, a tributary of Sixtymile river.
1913	".....	Base line on part of Barlow and Clear creeks.
1912	".....	" " Minto creek.
1912	".....	Reference traverse from mouth of Clear creek, on Stewart river to mouth of Fla creek on Klondike river.
1913	".....	Reference traverse on McKinnon creek, a tributary of Indian river.
1911	".....	Triangulation topographical survey on Klondike watershed.
1913	H. G. Dickson..	Ibex river reference traverse Whitehorse district.
1912	".....	Base line on Nansen creek a tributary of Nisling river.
1912	".....	" Summit " Nansen creek.
1912	".....	" Courtland " "
1912	".....	" Dolly " "
1912	".....	" Webber " "
1912	".....	" Cabin " "
1912	".....	" Center " "
1912	".....	" Newbauer " "
1912	".....	" Discovery pup " "
1912	".....	" Shaw creek " "
1912	".....	" Eliza " "
1912	".....	" Rush " "
1912	".....	" Slate " "
1912	".....	" East Fork " "
1912	".....	" South " "
1912	".....	" Victoria creek a tributary of Nisling river.
1912	".....	" Dome " "
1912	".....	" Back " "



## APPENDIX No. 5.

## STATEMENT of work executed in the Topographical Surveys Branch.

Letters of instruction to surveyors.....	365
Progress sketches received and filed.....	1,304
Declarations of settlers received and filed.....	107
Returns of timber berths received.....	11
Plans received from surveyors.....	762
Field books received from surveyors.....	782
Timber reports received.....	219
Observations for magnetic declination received.....	1,295
Preliminary township plans prepared.....	371
Sketches made.....	7,971
Maps and tracings made.....	236
Plans of Yukon lots received.....	20
Plans of miscellaneous Yukon surveys received.....	25
Returns of surveys examined—	
Township subdivision.....	729
Township outline.....	243
Road plans.....	405
Railway plans.....	36
Yukon lots.....	20
Miscellaneous Yukon surveys.....	25
Mineral claims.....	26
Timber berths.....	24
Correction and other miscellaneous surveys.....	95
Township plans compiled.....	97
Townsite settlement and other plans compiled.....	10
Proofs of plans examined.....	42
Township plans printed.....	910
Townsite and settlement plans printed.....	13
Miscellaneous plans printed.....	151
Descriptions written.....	12
Areas calculated.....	394
Pages of field notes copied.....	386
Applications for various information dealt with.....	2,446
Files received and returned.....	1,734
Letters and memoranda drafted.....	11,964
Books received from Record Office and used in connection with office work.....	5,712
Books returned to Record Office.....	5,068
Plans other than printed township plans received from Record Office and used in connection with office work.....	944
Plans returned to Record Office.....	537
Volumes of plans received from Record Office and used in connection with office work.....	53
Volumes of plans returned to Record Office.....	52
Books sent to Record Office to be placed on record.....	549
Plans other than township plans sent to Record Office to be placed on record.....	105
Sectional maps (3 miles to 1 inch)—	
Revised and reprinted.....	25
Reprinted but not revised.....	7
New maps compiled and printed.....	9
Sectional maps (6 miles to 1 inch)—	
Reprinted.....	59
New maps printed.....	9



SESSIONAL PAPER No. 25b

## APPENDIX No. 6

LIST of New Editions of Sectional Maps compiled from April 1, 1913, to March 31, 1914.

Scale, 3 miles to 1-inch.

No.	Name.	No.	Name.
10	Port Moody.	216	Sullivan Lake.
11	Yale.	220	Nut Mountain.
15	Lethbridge.	264	Brazeau.
18	Wood Mountain.	266	Ribstone Creek.
21	Turtle Mountain.	269	Prince Albert South.
22	Dufferin.	270	Pasquia.
23	Emerson.	313	Brulé.
61	Lytton.	315	Edmonton.
65	Macleod.	320	Carrot River.
68	Swift Current.	363	Baptiste.
71	Brandon.	413	Iosegun.
72	Portage la Prairie.	414	Saulteux.
73	Winnipeg.	415	Tawatinaw.
119	Regina.	461	Moberly.
120	Qu'Appelle.	463	Smoky River.
121	Riding Mountain.	465	Pelican.
122	Manitoba House.	466	Landels.
163	Donald.	511	St. John.
165	Rosebud.	512	Montagneuse.
170	Yorkton.	516	McMurray.
214	Rocky Mountain House.		

Scale, 6 miles to 1-inch.

No.	Name.	No.	Name.	No.	Name.
10	Port Moody.	120	Qu'Appelle.	270	Pasquia.
11	Yale.	121	Riding Mountain.	313	Brulé.
14	Pincer Creek.	122	Manitoba House.	314	St. Ann.
15	Lethbridge.	163	Donald.	315	Edmonton.
18	Wood Mountain.	164	Morley.	320	Carrot River.
21	Turtle Mountain.	165	Rosebud.	363	Baptiste.
22	Dufferin.	166	Sounding Creek.	364	Et. Assiniboine.
23	Emerson.	168	The Elbow.	365	Victoria.
24	Lake of the Woods.	170	Yorkton.	366	Saddle Lake.
61	Lytton.	171	Duck Mountain.	367	Meadow Lake.
65	Macleod.	214	Rocky Mountain House.	368	Green Lake.
66	Medicine Hat.	215	Red Deer.	413	Iosegun.
68	Swift Current.	216	Sullivan Lake.	414	Saulteux.
69	Moosejaw.	219	Humboldt.	415	Tawatinaw.
70	Moose Mountain.	220	Nut Mountain.	416	La Biche.
71	Brandon.	262	Yellowhead.	461	Moberly.
72	Portage la Prairie.	263	Jasper.	463	Smoky River.
73	Winnipeg.	264	Brazeau.	464	Giroux.
74	Cross Lake.	265	Peace Hills.	465	Pelican.
114	Calgary.	266	Ribstone Creek.	466	Landels.
115	Blackfoot.	267	Battleford.	511	St. John.
118	Rush Lake.	269	Prince Albert South.	512	Montagneuse.
119	Regina.			516	McMurray.



## APPENDIX No. 7.

STATEMENT of work executed in the Photographic Office from April 1, 1913 to March 31, 1914.

	3½ x 3½	3½ x 5½	5 x 7	8 x 10	10 x 12	11 x 14	15 x 18	16 x 18	18 x 20	20 x 24	24 x 32	25 x 35	30 x 36	36 x 42	42 x 48	Total.
Dry plates and films	22	952	1,042	2		4										2,022
Bromide prints			44	148	615	1,492		251	220	101	22		75	65	85	3,118
Sello			1,019	222		7										1,248
Velox	212	8,583	5,300	389		52										14,536
Artura			13	13												13
Vandyke			4	19	8	127		66	140	77	98		140	109	141	929
Blue			8	54	25	313		326	117	197	228		260	200	85	1,813
Lantern slides	148							16	8	2						148
Photographs mounted			157	265												448
Wet plate negatives				156		292	1,271		200	57	51					2,027
Photo-litho plates									125	20		5	653			803
	382	9,535	7,574	1,268	648	2,287	1,271	659	810	454	319	5	1,128	374	311	27,105



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## APPENDIX No. 8.

STATEMENT of work executed in the Lithographic Office from April 1, 1913, to March 31, 1914.

Month.	MAPS.			TOWNSHIP PLANS.			FORMS.		
	No.	Copies.	Im-pressions.	No.	Copies.	Im-pressions.	No.	Copies.	Im-pressions.
1913.									
April.....	8	1,325	2,150	58	11,600	12,400	7	5,275	5,275
May.....	15	4,800	5,475	65	13,000	13,000	8	5,541	5,541
June.....	8	3,500	3,500	59	11,800	12,000			
July.....	3	225	600	28	5,600	5,800	5	35,000	35,000
August.....	7	16,875	75,775	36	7,200	7,200	3	1,650	1,650
September.....	11	15,925	63,950	72	14,400	14,600	4	3,500	3,500
October.....	54	23,425	24,025	43	8,600	8,600	5	1,600	1,600
November.....	45	18,925	19,650	84	16,800	17,600	5	9,100	10,300
December.....	9	3,375	3,525	64	12,800	12,800	3	3,500	3,500
1914.									
January.....	17	27,540	71,550	174	34,800	35,000	4	8,750	8,750
February.....	14	28,380	97,725	142	24,300	24,300	2	600	600
March.....	15	2,810	4,935	85	17,000	24,600	10	26,200	26,200
Total.....	206	147,105	372,860	910	177,900	188,000	56	100,716	101,916

## RECAPITULATION.

	No.	Copies.	Impressions.	Cost.
Maps .....	206	147,105	372,860	3,425 74
Townships .....	910	177,900	188,000	3,776 00
Forms.....	56	100,716	101,916	927 76
Grand total.....	1,172	425,721	662,776	8,129 50

NOTE.—In the above schedule, the figures given for "cost" cover only the wages of the lithographers and printers: they do not include the cost of paper, machinery, supplies, rent, etc.



## APPENDIX No. 9.

LIST OF EMPLOYEES of the Topographical Surveys Branch at Ottawa, on April 1, 1914, with the name, classification, duties of office and salary of each. (Metcalf street, corner of Slater.)

NAME.	CLASSIFICATION.		Duties of Office.	Salary.
	Division.	Sub-division.		
				\$
Deville, E., D.T.S., LL.D.....	1	A	Surveyor General.....	3,950
Shanks, T., B.A.Sc., D.L.S.....	1	A	Asst. Surveyor General.....	2,800
	Correspondence.			
Brady, M.....	1	B	Secretary.....	2,600
Cullen, M. J.....	3	A	Clerk.....	1,200
Moran, J. F.....	3	A	".....	1,050
Williams, E. R.....	3	A	".....	1,050
Addison, W. G.....	3	A	Stenographer.....	950
Renault, J. F.....	3	B	".....	750
Pegg, A.....			Messenger.....	800
O'Meara, M. T.....			".....	650
	Accounts.			
Hunter, R. H.....	2	A	Accountant.....	2,100
Lemay, A.....	2	A	Asst. Accountant.....	1,650
McPhail, N. R.....	2	B	".....	1,000
	Field work.			
Brown, T. E., B.A.....	1	B	Supervisor of field work.....	2,750

## DIVISION I.

## Survey Instructions and General Information.

Barber, H. G., Grad. S.P.S.....	1	B	Chief of division.....	2,200
Rice, F. W., Grad. School of Mining.....	2	A	Technical clerk.....	2,000
MacIlquham, W. L., B.Sc.....	2	A	".....	2,000
Weld, W. R.....	2	A	".....	2,000
Peaker, W. J., Grad. S.P.S.....	2	A	".....	1,700
Carroll, M. J., Grad. S.P.S.....	2	A	".....	1,700
Rochon, E. C.....	2	A	".....	1,650
McRae, A. D., B.A., B.Sc.....	2	A	Supply clerk.....	1,650
Grant, A. W., B.A.....	2	A	Editor.....	1,650
Hayward, H. E., B.Sc.....	2	A	Registration clerk.....	1,600
MacMillan, J. P., B.E.....	2	B	Technical clerk.....	1,400
Wadlin, L. N., B.Sc., D.L.S.....	2	B	".....	1,150
Gagnon, J. N. H., B.A.S.....	2	B	".....	1,150
Armstrong, W. B., B.Sc.....	2	B	".....	1,300
Nevins, L. A., B.A.....	2	B	".....	1,300
McDonald, J. F., B.A.....	2	B	Registration clerk.....	1,300
Sammon, J. J., B.A.....	2	B	".....	1,250
Fleming, A. C., B.A.....	2	B	".....	1,250
Quinlan, L. J., B.A.Sc.....	2	B	Technical clerk.....	1,250
Lawrence, J., B.Sc.....	2	B	".....	1,200
Gallagher, O. G., B.Sc.....	2	B	".....	1,200
Miller, A. H., B.A.....	2	B	".....	1,200
Burkholder, E. L.....	3	A	Clerk.....	1,050



SESSIONAL PAPER No. 25b

APPENDIX No. 9—*Continued.*

## DIVISION II.

## Examination of Survey Returns and Compilation of Plans.

Name.	Classification.		Duties of Office.	Salary.
	Division.	Sub-division.		
				\$
Nash, T. S., Grad. S.P.S., D.L.S. ....	1	B	Chief of division .....	2,750
Dennis, E. M., B.Sc. ....	1	B	Surveys examiner.....	2,100
Hill, S. N., Grad. S.P.S. ....	1	B	" .....	2,100
Elder, A. J., Grad. S.P.S., D.L.S. ....	2	A	" .....	2,000
Genest, P. F. X., Q.L.S. ....	2	A	" .....	2,000
Kitto, F. H., D.L.S. ....	2	A	Director of surveys (Yukon) ..	1,700
McClennan, W. D. ....	2	A	Surveys examiner.....	1,700
Roger, A., O.L.S. ....	2	A	" .....	1,700
Sutherland, H. E., B.Sc. ....	2	A	" .....	1,650
Ault, H. W. ....	2	A	" .....	1,650
Bray, R. P. ....	2	A	" .....	1,650
Spreckley, R. O. ....	2	A	" .....	1,600
Goodday, Leonard. ....	2	A	" .....	1,500
Harrison, E. W. ....	2	B	" .....	1,400
Lytle, W. J. ....	2	B	Recorder .....	1,150
LaBeree, E. E. ....	2	B	Surveys examiner.....	1,150
Jones, G. S., Grad. S.P.S., O.L.S. ....	2	B	" .....	1,150
Bradley, J. D. ....	2	B	" .....	1,150
Kirwan, G. L., B.A.Sc. ....	2	B	" .....	1,250
Callender, R., B.Sc. ....	2	B	" .....	1,200
Cram, R. M., B.Sc. ....	2	B	" .....	1,200
Timbrell, E. G., B.Sc. ....	2	B	" .....	1,200
Macdonald, J. A. ....	3	B	Clerk .....	800

## DIVISION III.

## Drafting and Printing, Imperial Building, Queen Street.

Engler, Carl., B.A., D.L.S. ....	1	B	Chief of division.....	2,300
May, J. E. ....	2	A	Draughtsman.....	2,000
O'Connell, J. R. ....	2	A	Draughtsman and engraver..	1,800
Moule, W. J. ....	2	B	Litho-designer.....	1,600
Helmer, J. D. ....	2	B	Draughtsman.....	1,200
Dawson, R. J. ....	2	B	Stamper .....	1,200
Archambault, E. ....	2	B	Draughtsman and stamper...	1,200
Watters, James. ....	3	A	Printer.....	1,200
McLennan, A. G. ....	3	A	Recorder.....	1,200
Brown, A. ....	3	A	Stamper .....	1,050
Ebbs, E. J. ....	3	A	" .....	1,050
Baril, C. ....	3	A	Clerk.....	900

## DIVISION IV.

## British Columbia Surveys, Imperial Building, Queen Street.

Rowan-Legg, E. L. ....	2	A	Chief of division.....	2,100
Gillmore, E. T. B., Grad. R.M.C. ....	2	A	Surveys examiner.....	2,100
Morley, R. W. ....	2	A	" .....	2,000
Wilson, E. E. D., B.Sc. ....	2	A	" .....	1,750
Harris, K. D. ....	2	A	" .....	1,600



## APPENDIX No. 9—Continued.

## DIVISION V.

Mapping, Imperial Building, Queen Street.

Name.	Classification.		Duties of Office.	Salary.
	Division.	Sub-division.		
				\$
Smith, J. ....	1	B	Chief of division .....	2,750
Begin, P. A. ....	2	A	Draughtsman .....	2,050
Blanchet, A. E. ....	2	A	" .....	1,650
Côté, J. A., Grad. R.M.C. ....	2	A	Editor of reports .....	1,750
D'Orsonnens, A. ....	2	A	Draughtsman .....	1,700
Flindt, A. H. ....	2	A	" .....	1,800
Davies, T. E. S. ....	2	A	Recorder .....	1,600
Purdy, W. A. ....	2	A	Draughtsman .....	1,600
Bergin, W. ....	2	B	" .....	1,200
Blanchard, J. F. ....	2	B	Technical Clerk .....	1,200
Colquhoun, G. A., B. Sc. ....	2	B	" .....	1,300
Davy, E. ....	2	B	Draughtsman .....	1,500
Howie, Jas. ....	2	B	" .....	1,150
Perrin, V. ....	2	B	" .....	1,600
Squire, R. L. ....	2	B	Technical Clerk .....	1,200
Villeneuve, E. ....	2	B	Draughtsman .....	1,200

## DIVISION VI.

Special Surveys, Imperial Building, Queen Street.

Dodge, G. B., D.L.S. ....	1	B	Chief of division and Supt. Surveys Laboratory .....	2,750
Watt, G. H., Grad. S.P.S., D.L.S. ....	2	A	Computer .....	2,000
Way, W. C., M.Sc. ....	2	A	Asst. Supt. Sur. Laboratory .....	1,650
Milliken, J. B., B.A., B.Sc., D.L.S. ....	2	A	Examiner of baseline surveys .....	1,600
Parry, H., B.Eng., D.L.S. ....	2	A	Mathematician .....	1,600
Wardle, J. M., B.Sc. ....	2	B	Laboratory assistant .....	1,250
Fredette, J. F., D.L.S. ....	2	B	" .....	1,200
Hughson, W. G., B.Sc. ....	2	B	" .....	1,250
Cannell, H. W., D.L.S. ....	2	B	Computer .....	1,250
Cousineau, A., B.Sc. ....	2	B	" .....	1,200
Herbert, W. H., B.Sc. ....	2	B	" .....	1,300
Roe, B. J., ....	2	B	Computer .....	1,250
Ross, R. C., B.Sc. ....	2	B	" .....	1,300
Lynch, F. J., ....	3	B	Stenographer .....	800
Watson, J. W. ....	3	B	Clerk .....	800
Pick, A. C. ....			Messenger .....	650

Chief Inspector of Surveys Office, 98 Wellington Street.

Hubbell, E. W., D.L.S. ....	1	B	Chief inspector .....	2,800
Sylvain, John. ....	2	A	Assistant .....	1,800
Stalker, Miss M. W. ....	3	A	Stenographer .....	1,050

Board of Examiners for D.L.S.

Henderson, F. D., Grad. S.P.S., D.L.S. ....	1	B	Secretary .....	2,100
Nolan, Miss A. A. ....	3	B	Stenographer .....	500



SESSIONAL PAPER No. 25b

APPENDIX No. 9—*Concluded.*

Geographic Board, Woods Building, Slater Street.

Name.	Classification.		Duties of Office.	Salaries.
	Division.	Sub-division.		
Whitcher, A. H., F.R.G.S., D.L.S. ....	2	A	Secretary. ....	\$ 2,100

Photographic Office, Metcalfe Street, corner Slater Street.

Carruthers, H. K. ....	2	A	Process photographer . . .	2,000
Woodruff, John. ....	2	A	Chief " . . . . .	2,000
Collins, G. H. A. ....	2	B	Photographer. ....	1,000
Whitcomb, H. E. ....	3	A	" . . . . .	1,200
Morgan, W. E. ....	3	A	" . . . . .	1,200
Kilfuartin, A. ....	3	A	Asst. photographer. ....	1,050
Ouimet, E. G. ....	3	B	" . . . . .	950

Lithographic Office, Imperial Building, Queen Street.

Name.	Occupation.	Salaries.
Moody, A. ....	Foreman . . . . .	\$27 00 per week.
Burnett, E. ....	Lithographer. ....	25 00 "
Thicke, C. R. ....	" . . . . .	23 00 "
Deslauriers, J. H. ....	Transferrer. ....	20 00 "
Bergin, J. ....	Printer. ....	21 00 "
Thicke, H. S. ....	" . . . . .	20 00 "
Boyle, S. ....	Stone polisher . . . . .	15 00 "
Gagnon, J. ....	Press feeder . . . . .	12 00 "
Kane, P. ....	" . . . . .	9 50 "
Easton, R. M. ....	Printer. ....	19 50 "
Hare, E. H. ....	Asst. photographer . . . . .	15 00 "



## APPENDIX No. 10.

LIST of Dominion Land Surveyors who are in possession of Standard Measures.

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Akins, James Robert.....	Ottawa, Ont.....	Sept. 2, '76	Mar. 14, '10	
Allison, Calvin Bruce.....	South Woodslee, Ont.	June 16, '84	Mar. 28, '10	O.L.S.
Ashton, Arthur Ward.....	Ottawa, Ont.....	Nov. 5, '80	May 29, '08	B.C.L.S.
Austin, George Frederick.....	Not known.....	.....	April 14, '72	
Aylen, John.....	North Bay, Ont.....	.....	May 29, '85	
Aylsworth, Charles Fraser.....	Madoc, Ont.....	April 21, '62	May 13, '86	O.L.S.
Baker, James Clarence.....	Vermilion, Alta.....	May 12, '78	May 18, '06	A.L.S.
Baker, Mason Hermon.....	St. Thomas, Ont.....	July 9, '84	Aug. 6, '08	O.L.S.
Bartlett, Ernest.....	Medicine Hat, Alta.	'83 Jan. 16, '11	A.L.S.	
Bayne, George A.....	Winnipeg, Man.....	Oct. 25, '50	April 14, '72	M.L.S.
Beatty, David.....	Parry Sound, Ont.....	Dec. 22, '42	April 14, '72	O.L.S.
Begg, William Arthur.....	Hamilton, Ont.....	July 15, '82	June 8, '09	S.L.S.
Belanger, Phidime Roch Arthur	Ottawa, Ont.....	Mar. 5, '53	May 17, '80	Inspector of Surveys, Topographical Surveys Branch, Dept. of the Interior.
Belleau, Joseph Alphonse.....	Ottawa, Ont.....	Sept. 30, '56	May 15, '83	Land Patents Branch, Department of Interior.
Belyea, Albert Palmer Corey.....	Edmonton, Alta.....	.....	July 14, '09	A.L.S.
Bemister, George Bartlett.....	Winnipeg, Man.....	.....	June 11, '78	M.L.S. Engineering Dept. C.N.R.
Bennett, George Arthur.....	Ottawa, Ont.....	May 18, '86	Aug. 25, '10	A.L.S.
Berry, Edward Wilson.....	Seaforth, Ont.....	Aug. 26, '81	May 18, '11	
Bigger, Charles Albert.....	Ottawa, Ont.....	Aug. 15, '53	Mar. 30, '82	B.C.L.S., O.L.S., Assistant Superintendent Geodetic Survey.
Bingham, Edwin Ralph.....	Fort William, Ont.....	.....	'78 Oct. 25, '06	O.L.S.
Blanchet, Guy Houghton.....	Ottawa, Ont.....	Feb. 12, '34	Mar. 10, '10	
Boivin, Elzear.....	Edmonton, Alta.....	June 13, '57	Nov. 13, '83	
Boswell, Elias John.....	Montreal, Que.....	Sept. 26, '70	Mar. 18, '03	O.L.S., M.L.S.
Boulton, William James.....	Wallaceburg, Ont.....	Oct. 2, '84	Mar. 7, '12	
Bourgeault, Armand.....	St. Jean Port Joli, Que.....	Feb. 23, '58	Mar. 29, '83	Q.L.S.
Bourgault, Charles Eugene.....	Lauzon, Levis, Que.....	Sept. 6, '61	Feb. 21, '88	
Bourget, Charles Arthur.....	Lauzon, Que.....	Aug. 26, '51	May 14, '84	Q.L.S.
Bowman, Edgar Peterson.....	West. Montrose, Ont.	Sept. 29, '83	Sept. 26, '07	O.L.S.
Bowman, Herbert Joseph.....	Berlin, Ont.....	June 18, '65	Feb. 16, '88	O.L.S.
Brabazon, Alfred James.....	Ottawa, Ont.....	.....	May 13, '82	Boundary Surveys, Dept. of the Interior.
Bray, Samuel.....	Ottawa, Ont.....	Nov. 5, '46	Nov. 14, '83	O.L.S., Chief Surveyor, Dept. of Indian Affairs.
Bray, Lennox Thomas.....	Edmonton, Alta.....	Mar. 14, '77	Feb. 18, '03	O.L.S., A.L.S.
Brenot, Lucien.....	Ottawa, Ont.....	Aug. 31, '87	Mar. 18, '10	
Bridgland, Morrison Parsons.....	Calgary, Alta.....	Dec. 20, '78	Mar. 10, '05	A.L.S.
Broughton, George Henry.....	Penticton, B.C.....	Aug. 12, '86	June 3, '09	B.C.L.S.
Brown, Charles Dudley.....	Winnipeg, Man.....	Feb. 25, '83	April 4, '10	A.L.S., S.L.S.
Brown, Edgar Carl.....	Winnipeg, Man.....	Nov. 28, '86	May 23, '11	A.L.S., S.L.S.
Brown, Thomas Wood.....	Saskatoon, Sask.....	Nov. 10, '79	June 21, '09	A.L.S., S.L.S.
Brownlee, James Harrison.....	Vancouver, B.C.....	Mar. 22, '56	April 15, '87	M.L.S., B.C.L.S.
Buchanan, John Alexander.....	Edmonton, Alta.....	Mar. 4, '87	May 17, '12	A.L.S.
Burd, James Henry.....	Weyburn, Sask.....	Sept. 7, '81	May 18, '11	O.L.S., S.L.S.
Burgess, Edward LeRoy.....	Kamloops, B.C.....	May 5, '78	Feb. 23, '05	O.L.S.
Burnet, Hugh.....	Victoria, B.C.....	.....	June 22, '85	O.L.S., B.C.L.S.
Burwash, Nathaniel Alfred.....	Toronto, Ont.....	Sept. 28, '79	Mar. 6, '07	O.L.S.
Burwell, Herbert Mahlon.....	Vancouver, B.C.....	Oct. 23, '63	Feb. 17, '87	B.C.L.S.
Calder, John Alexander.....	Lytton, B.C.....	June 2, '86	May 21, '12	
Cameron, Charles Scott.....	Beaverton, Ont.....	Dec. 6, '84	Mar. 15, '13	
Campbell, Alan John.....	Sidney, B.C.....	Oct. 1, '82	April 13, '09	B.C.L.S., A.L.S.
Campbell, Alexander Stewart.....	Kingston, Ont.....	Mar. 7, '80	Mar. 6, '09	O.L.S.
Carbert, Joseph Al red.....	Medicine Hat, Alta.	Feb. 4, '56	May 12, '80	O.L.S., A.L.S., District Engineer and Surveyor, Dept. of Public Works, Alberta.
Carpenter Henry Stanley.....	Regina, Sask.....	Feb. 8, '74	Feb. 20, '01	O.L.S., S.L.S., Department of Public Works.
Carroll, Cyrus.....	Regina, Sask.....	Dec. 6, '34	April 14, '72	O.L.S., S.L.S.



## SESSIONAL PAPER No. 25b

APPENDIX No. 10—*Continued.*LIST of Dominion Land Surveyors who are in possession of Standard Measures.—  
*Continued.*

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Carson, Percy Alexander.....	Calgary, Alta.....	Dec. 25, '77	Feb. 22, '06	Hydrographic Survey.
Carthew, William Morden.....	Edmonton, Alta.....	Oct. 19, '86	Mar. 29, '10	A.L.S.
Carthew, John Trewalla.....	Edmonton, Alta.....	Feb. 15, '91	Mar. 15, '13	
Cautley, Reginald Hutton.....	Edmonton, Alta.....	Dec. 6, '79	May 1, '05	A.L.S.
Cautley, Richard William.....	Edmonton, Alta.....	Aug. 3, '73	Sept. 2, '96	A.L.S.
Cavana, Allan George.....	Orillia, Ont.....	Jan. 22, '58	Nov. 16, '76	O.L.S.
Charlesworth, Lionel Clare....	Edmonton, Alta.....	Nov. 17, '73	Mar. 24, '03	O.L.S., A.L.S., Dept. of Public Works, Alberta.
Chase, Albert Victor.....	Orillia, Ont.....	Mar. 4, '83	Oct. 11, '10	O.L.S.
Chilver, Charles Alonzo.....	Walkerville, Ont.....	Feb. 8, '83	Feb. 22, '07	
Christie, William.....	Prince Albert, Sask.....	Feb. 13, '76	Mar. 22, '06	S.L.S.
Clarke, Frederick Fieldhouse....	Toronto, Ont.....	Aug. 22, '78	Feb. 18, '08	O.L.S.
Clarke, Charles Wentworth....	Regina, Sask.....	Nov. 19, '75	Mar. 21, '10	S.L.S.
Cleveland, Ernest Albert.....	Vancouver, B.C.....	May 12, '74	June 27, '99	B.C.L.S.
Coates, Preston Charles.....	Victoria, B.C.....	May 16, '81	April 19, '07	B.C.L.S.
Cokely, Leroy S.....	Duncan, B.C.....	Nov. 23, '84	Mar. 22, '10	B.C.L.S.
Coltham, George William.....	Aurora, Ont.....	Feb. 19, '89	Mar. 15, '13	O.L.S.
Cond, Fritz Thomas Piercy....	Vancouver, B.C.....	May 16, '86	May 18, '11	B.C.L.S.
Côté, Joseph Adélar.....	Prince Albert, Sask.....	June 5, '64	May 14, '84	S.L.S.
Côté, Jean Léon.....	Edmonton, Alta.....	May 6, '67	Mar. 21, '90	A.L.S.
Côté, Joseph Martial.....	Ottawa, Ont.....	Aug. 25, '89	May 13, '13	
Cotton, Arthur Frederick.....	Masset, B.C.....	Aug. 8, '52	May 11, '80	O.L.S., B.C.L.S.
Cowper, George Constable.....	Welland, Ont.....	Oct. 20, '86	Mar. 11, '11	
Craig, John Davidson.....	Ottawa, Ont.....	Jan. 30, '76	Feb. 24, '02	Boundary Surveys, Dept. of the Interior.
Cumming, Austin Lewis.....	Edmonton, Alta.....	Aug. 25, '82	Feb. 3, '10	A.L.S.
Cummings, Alfred.....	Fernie, B.C.....	July 3, '80	Mar. 3, '09	B.C.L.S.
Cummings, John George.....	Cranbrook, B.C.....	Nov. 19, '73	Feb. 17, '04	B.C.L.S.
Dalton, John Joseph.....	Weston, Ont.....	June 12, '54	Apr. 17, '79	O.L.S., D.T.S.
Davies, Thomas Attwood.....	Edmonton, Alta.....	.....	Feb. 22, '06	A.L.S.
Dawson, Frederick James.....	Kamloops, B.C.....	Sept. 22, '86	Sept. 12, '10	B.C.L.S.
Day, Harry Samuel.....	Edmonton, Alta.....	Nov. 14, '85	Mar. 9, '10	A.L.S.
Deans, William James.....	Brandon, Man.....	May 4, '60	May 13, '86	O.L.S.
de la Condamine, C.....	Calgary, Alta.....	Feb. 13, '75	May 4, '10	A.L.S.
Dennis, John Stoughton.....	Calgary, Alta.....	Oct. 22, '56	Nov. 19, '77	D.T.S.
Denny, Herbert C.....	Not known.....	.....	Apr. 1, '82	
Dickson, Henry Godkin.....	Whitehorse, Y.T.....	Mar. 29, '64	Mar. 19, '89	M.L.S.
Dickson, James.....	Fenelon Falls, Ont.....	Oct. 30, '34	Apr. 14, '72	O.L.S.
Dobie, James Samuel.....	Thessalon, Ont.....	Oct. 15, '73	Mar. 22, '06	O.L.S.
Donnelly, Cecil.....	Winnipeg, Man.....	Oct. 18, '89	Mar. 15, '13	M.L.S.
Doupe, Jacob Lonsdale.....	Winnipeg, Man.....	Sept. 14, '67	Oct. 6, '88	M.L.S., A.L.S., S.L.S., Asst. Land Commissioner for C.P.R.
Drewry, William Stewart.....	Victoria, B.C.....	Jan. 20, '59	Nov. 14, '83	O.L.S., B.C.L.S.
Driscoll, Alfred.....	Edmonton, Alta.....	July 2, '65	Feb. 23, '87	B.C.L.S., A.L.S.
Drummond, Thomas.....	Montreal, P.Q.....	.....1856	June 24, '78	D.T.S.
Duc, William A.....	Winnipeg, Man.....	April 4, '52	Mar. 30, '83	O.L.S., M.L.S.
Dumaïs, Paul T. Concorde.....	Hull, P.Q.....	Jan. 2, '47	Mar. 29, '82	Q.L.S.
Earle, Wallace Sinclair.....	Vancouver, B.C.....	Feb. 8, '89	May 18, '11	B.C.L.S., O.L.S.
Edwards, George.....	Ponoka, Alta.....	June 13, '42	Apr. 14, '72	O.L.S., A.L.S.
Edwards, William Milton.....	Lethbridge, Alta.....	June 21, '79	Apr. 5, '10	A.L.S.
Ellacott, Charles Herbert.....	Victoria, B.C.....	Dec. 24, '66	Feb. 22, '99	B.C.L.S.
Ellis, Douglas Stewart.....	Kingston, Ont.....	Mar. 16, '85	May 17, '12	
Empey, John Morgan.....	Calgary, Alta.....	Apr. 16, '74	Feb. 23, '05	O.L.S., A.L.S.
Engler, Carl.....	Ottawa, Ont.....	Sept. 30, '72	Feb. 23, '05	T. S. Branch, Dept. of Interior.
Evans, Stanley Livingstone....	Corinth, Ont.....	Jan. 14, '84	Feb. 13, '11	
Fairchild, Charles Courtland..	Edmonton, Alta.....	Feb. 21, '67	Feb. 20, '01	O.L.S., A.L.S.
Farncomb, Alfred Ernest.....	Edmonton (South) Alta.....	May 22, '73	Mar. 12, '02	O.L.S., A.L.S.
Fawcett, Adam.....	Gravenhurst, Ont.....	.....	Feb. 22, '93	
Fawcett, Sydney Dawson.....	Ottawa, Ont.....	Oct. 29, '82	May 18, '11	
Fawcett, Thomas.....	Ottawa, Ont.....	Oct. 28, '48	Nov. 18, '76	O.L.S., D.T.S., Boundary Surveys, Dept. of Interior.



APPENDIX No. 10—*Continued.*LIST of Dominion Land Surveyors who are in possession of Standard Measures—*Continued.*

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Ferguson, George Hendry.....	Toronto, Ont.....	Jan. 20, '83	June 2, '09	
Findlay, Allan.....	Winnipeg, Man.....	Oct. 15, '80	Mar. 21, '08	M.L.S.
Fletcher, James Allan.....	Fletcher, Ont.....	Mar. 26, '89	May 18, '11	
Fontaine, Louis Elie.....	Levis, P.Q.....	Oct. 3, '68	Nov. 30, '92	A.L.S., Inspector of Surveys, Dept. of Interior.
Francis, John.....	Portage la Prairie, Man.....	Dec. 22, '52	June 17, '75	M.L.S.
Galletly, James Simpson.....	Brooklin, Ont.....	Apr. 15, '88	May 18, '11	
Garden, James Ford.....	Vancouver, B.C.....	Feb. 19, '47	May 13, '80	B.C.L.S.
Garden, George H.....	Lethbridge, Alta.....	Apr. 14, '72	Apr. 14, '72	Deputy Surveyor for N.B.
Garden, Charles.....	Not known.....	Apr. 14, '72	Apr. 14, '72	Deputy Surveyor for N.B.
Garner, Albert Coleman.....	Regina, Sask.....	Sept. 6, '78	May 27, '07	S.L.S., A.L.S., Chief Surveyor Surveys Branch Land Titles Offices.
Gauvreau, Louis Pierre.....	Not known.....	Apr. 14, '72	Apr. 14, '72	
Gibbon, James.....	Vancouver, B.C.....	June 23, '60	Feb. 12, '91	O.L.S.
Glover, Arthur Edward.....	Edmonton, Alta.....	Mar. 4, '87	Mar. 11, '11	A.L.S., S.L.S.
Gordon, Maitland Lockhart.....	Vancouver, B.C.....	Sept. 27, '82	Feb. 18, '04	B.C.L.S.
Gordon, Robert John.....	Lethbridge, Alta.....	June 18, '69	Mar. 12, '02	A.L.S.
Gore, Thomas Sinclair.....	Victoria, B.C.....	1852	Apr. 19, '79	B.C.L.S.
Graham, John Robertson.....	Vancouver, B.C.....	Apr. 18, '87	May 26, '10	B.C.L.S.
Grassie, Charles Andrew.....	Medicine Hat, Alta.....	Dec. 24, '83	Dec. 27, '10	A.L.S.
Gray, James Edward.....	Edmonton, Alta.....	Oct. 12, '81	Mar. 11, '11	A.L.S., S.L.S.
Green, Alfred Harold.....	Nelson, B.C.....	Jan. 20, '79	Feb. 23, '05	B.C.L.S., A.L.S.
Green, Thomas Daniel.....	Rocky Mountain House, Alta.....	Dec. 21, '57	May 19, '84	O.L.S.
Green, Frank Compton.....	Victoria, B.C.....	May 4, '73	May 8, '03	B.C.L.S.
Griffin, Albert Dyke.....	Elk Lake, Ont.....	Dec. 14, '60	May 13, '13	O.L.S.
Grover, George Alexander.....	Toronto, Ont.....	Feb. 18, '04	Feb. 18, '04	
Haggen, Rupert Williams.....	Quesnel, B.C.....	July 29, '87	May 18, '11	B.C.L.S.
Hamilton, Charles Thomas.....	Vancouver, B.C.....	July 29, '84	May 18, '11	B.C.L.S.
Hamilton, James Frederick.....	Lethbridge, Alta.....	April 4, '69	June 2, '09	A.L.S.
Harris, John Walter.....	Winnipeg, Man.....	Feb. 26, '45	April 14, '72	O.L.S., M.L.S., Assessment Commissioner and City Surveyor.
Harrison, Edward.....	Calgary, Alta.....	May 14, '10	May 14, '10	A.L.S.
Harvey, Charles.....	Kelowna, B.C.....	May 5, '76	Feb. 17, '04	B.C.L.S.
Hawkins, Albert Howard.....	Listowel, Ont.....	July 27, '62	Mar. 6, '06	
Heaman, John Andrew.....	Winnipeg, Man.....	June 3, '75	July 15, '09	O.L.S.
Heathcott, Robert Vernon.....	Edmonton, Alta.....	July 7, '81	May 13, '07	A.L.S.
Henderson, Walter.....	Not known.....	Nov. 17, '83	Nov. 17, '83	
Herriot, George Henry.....	Souris, Man.....	Feb. 23, '83	Sept. 18, '09	M.L.S.
Heuperman, Frederick Justinus.....	Calgary, Alta.....	July 23, '87	Mar. 13, '11	A.L.S.
Heuperman, Lambertus Fred.....	Calgary, Alta.....	Sept. 20, '81	Mar. 29, '10	A.L.S.
Hoar, Charles Millard.....	Calgary, Alta.....	Sept. 26, '85	Mar. 9, '11	A.L.S.
Hobbs, Wilfrid Ernest.....	Winnipeg, Man.....	Mar. 12, '87	Mar. 5, '12	M.L.S.
Holcroft, Herbert Spencer.....	Toronto, Ont.....	Sept. 4, '77	Feb. 18, '03	O.L.S.
Hopkins, Marshall Willard.....	Edmonton, Alta.....	May 24, '61	Feb. 20, '01	O.L.S., A.L.S.
Hubbell, Ernest Wilson.....	Ottawa, Ont.....	Nov. 5, '62	May 19, '84	Chief Inspector of Surveys, Dept. of Interior.
Hunter, Albert Ernest.....	Wiarton, Ont.....	Nov. 8, '87	Mar. 7, '12	
Inkster, Oluff.....	Edmonton, Alta.....	Mar. 25, '85	May 18, '11	A.L.S.
Jackson, John Edwin.....	Hamilton, Ont.....	Dec. 27, '81	May 18, '11	O.L.S.
James, Silas.....	Toronto, Ont.....	June 19, '34	April 14, '72	O.L.S.
Jephson, Richard Jermy.....	Brandon, Man.....	Feb. 5, '54	May 12, '80	O.L.S., B.C.L.S., M.L.S.
Johnson, Alfred William.....	Kamloops, B.C.....	Feb. 23, '74	Mar. 12, '02	B.C.L.S.
Johnson, Percy Nowell.....	Edmonton, Alta.....	Oct. 4, '75	May 10, '09	
Johnston, James Homer.....	Edmonton, Alta.....	Aug. 23, '87	May 17, '12	A.L.S.
Johnston, William James.....	St. Catharines, Ont.....	Jan. 31, '81	Mar. 11, '11	
Keith, Homer Pasha.....	Edmonton, Alta.....	Aug. 30, '85	Feb. 1, '11	A.L.S.
Kimpe, Maurice.....	Edmonton, Alta.....	Jan. 17, '76	May 13, '07	A.L.S.
King, William Frederick.....	Dominion Observatory, Ottawa, Ont.....	Feb. 19, '54	Nov. 21, '76	D.T.S. Chief Astronomer, Dept. of Interior.



## SESSIONAL PAPER No. 25b

APPENDIX No. 10—*Continued.*

LIST of Dominion Land Surveyors who are in possession of Standard Measures—  
*Continued.*

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Kirk, John Albert.....	Summerland, B.C....	Jan. 9, '54	May 11, '80	O.L.S., B.C.L.S.
Kitto, Franklin Hugo.....	Dawson, Y.T.....	Mar. 23, '80	Mar. 6, '08	
Klotz, Otto Julius.....	Dominion Observatory, Ottawa, Ont.	Mar. 31, '52	Nov. 19, '77	O.L.S., D.T.S., Astronomer, Dept. of Interior.
Knight, Richard H.....	Edmonton, Alta.....	June 7, '77	Feb. 18, '04	A.L.S.
Lamb, Frederick Carlyle.....	Saskatoon, Sask.....	Dec. 11, '88	May 17, '12	
Lang, John Leiper.....	Sault Ste. Marie, Ont.	Aug. 18, '84	Oct. 14, '08	O.L.S.
Latimer, Frank Herbert.....	Penticton, B.C.....	May 23, '60	Nov. 13, '85	B.C.L.S.
Laurie, Richard C.....	Battleford, Sask.....	Jan. 31, '58	April 27, '83	S.L.S.
Leblanc, Pierre Maxime Henri	Ottawa, Ont.....	Oct. 1, '84	May 13, '13	
Lemoine, Charles Errol.....	Ville Montcalm, P.Q.		Mar. 31, '82	Q.L.S.
Lighthall, Abram.....	Vancouver, B.C.....	Mar. 30, '78	Dec. 25, '09	
Lindsay, James Herbert.....	Prince Albert, Sask.	Nov. 27, '82	May 18, '11	S.L.S.
Loneragan, Gerald Joseph.....	Buckingham, P.Q....	Oct. 8, '71	Feb. 28, '01	Q.L.S., A.L.S., Inspector of Surveys, Dept. of Interior.
Loucks, Roy Wm. Egbert.....	Saskatoon, Sask.....	Oct. 31, '84	Mar. 1, '12	A.L.S., S.L.S.
Lumsden, Hugh David.....	St. Andrews, N.B.....	Sept. 7, '44	April 14, '72	O.L.S.
Macdonald, Colin Stone.....	Ottawa, Ont.....	May 26, '87	Mar. 10, '14	
Macdonald, Gordon Alexander.	Muirkirk, Ont.....	May 24, '85	May 17, '12	B.C.L.S.
MacLennan, Alexander L.....	Toronto, Ont.....	May 10, '78	Feb. 23, '05	S.L.S.
MacLeod, George Waters.....	Edmonton, Alta.....	—	'88 Mar. 1, '12	A.L.S.
MacPherson, Charles Wilfrid.	Dawson, Y.T.....	Sept. 6, '71	Mar. 7, '00	O.L.S.
Magrath, Charles Alexander ..	Ottawa, Ont.....	April 22, '60	Nov. 16, '81	O.L.S., B.C.L.S., D.T.S., Member International Waterways Commission.
Martindale, Ernest Smith.....	Kingsmill, Ont.....	May 20, '86	Mar. 11, '11	
Martyn, Oscar William.....	Regina, Sask.....	Dec. 2, '88	Mar. 11, '11	S.L.S.
Matheson, Hugh.....	Ottawa, Ont.....	May 2, '79	May 9, '11	
McArthur, James Joseph.....	Ottawa, Ont.....	May 9, '56	April 17, '79	Boundary Surveys, Dept. of Interior.
McCaw, Robert Daniel.....	Sidney, B.C.....	May 24, '83	Mar. 23, '09	O.L.S., B.C.L.S., A.L.S.
McColl, Gilbert Beebe.....	Winnipeg, Man.....	Oct. 8, '82	Mar. 20, '07	M.L.S., D.T.S.
McColl, Samuel Ebener.....	Winnipeg, Man.....	July 17, '86	May 18, '11	M.L.S.
McDiarmid, Stuart Stanley.....	Vancouver, B.C.....	Aug. 4, '81	Feb. 23, '05	B.C.L.S.
McDonald, Harold French.....	Winnipeg, Man.....	Nov. 22, '85	Mar. 3, '13	M.L.S., S.L.S., A.L.S.
McElhanney, Thomas Andrew.	Vancouver, B.C.....	April 21, '86	Mar. 17, '12	
McEwen, Duncan Findlay.....	Edmonton, Alta.....	Aug. 7, '76	May 18, '11	A.L.S.
McFadden, Moses.....	Vancouver, B.C.....	Aug. 26, '26	April 14, '72	O.L.S., M.L.S.
McFarlane, Walter Graham.....	Peace River Landing, Alta.....	Sept. 23, '75	May 19, '05	A.L.S.
McFarlane, John Baird.....	Toronto, Ont.....	Feb. 25, '79	June 3, '08	A.L.S.
McFee, Angus.....	Red Deer, Alta.....	July 14, '46	April 19, '79	A.L.S.
McGeorge, William Graham.....	Chatham, Ont.....	Mar. 22, '87	Mar. 31, '10	O.L.S.
McGrandle, Hugh.....	Wetaskiwin, Alta.....	Mar. 12, '57	Mar. 30, '83	O.L.S., A.L.S.
McKay, Robert B.....	Vancouver, B.C.....	April 21, '83	May 21, '12	
McKnight, James Henry.....	Simcoe, Ont.....	July 13, '85	May 13, '13	
McLellan, Roy Alexander.....	Toronto, Ont.....	July 31, '89	Mar. 15, '13	
McMaster, William Angus Alexander	Prince Albert, Sask.	Feb. 1, '85	July 6, '10	A.L.S., S.L.S.
McMillan, George.....	Finch, Ont.....	Dec. 9, '69	Feb. 22, '06	
McNaughton, Alexander L.....	Kelowna, B.C.....	Sept. 30, '81	Feb. 23, '05	O.L.S., B.C.L.S.
McPherson, Archibald John.....	Regina, Sask.....	—	'70 Feb. 21, '01	S.L.S.
McPhillips, Robert Charles.....	Winnipeg, Man.....	April 24, '56	May 17, '80	M.L.S.
McVittie, Archibald W.....	Victoria, B.C.....	May 5, '58	Mar. 30, '82	B.C.L.S.
Meadows, William Walter.....	Maple Creek, Sask.....	May 27, '73	Feb. 23, '05	O.L.S., S.L.S.
Melhuish, Paul.....	Vancouver, B.C.....	April 14, '87	May 18, '11	B.C.L.S.
Miles, Charles Falconer.....	Toronto, Ont.....	Jan. 30, '38	April 14, '72	O.L.S., Inspector of Surveys, Dept. of Interior.
Mitchell, Benjamin Foster.....	Edmonton, Alta.....	June 16, '80	April 16, '08	A.L.S.
Moberly, Harford Kenneth.....	Yorkton, Sask.....	—	'69 April 21, '03	S.L.S.
Montgomery, Royal Harp.....	Prince Albert, Sask.	May 20, '82	Feb. 23, '05	O.L.S., S.L.S.
Moore, Herbert Harrison.....	Calgary, Alta.....	Dec. 1, '69	Feb. 17, '04	A.L.S.
Morrier, Joseph Eldedge.....	Prince Albert, Sask.	Aug. 29, '74	May 16, '07	S.L.S.



APPENDIX No. 10—*Continued.*

LIST of Dominion Land Surveyors who are in possession of Standard Measures—  
*Continued.*

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Murray, Ernest William	Regina, Sask.	Mar. 20, '84	May 31, '10	S.L.S.
Narraway, Athos Maxwell	Ottawa, Ont.	July 19, '38	May 18, '11	
Neelands, Rupert A.	Hamiota, Man.	Aug. 26, '84	Mar. 5, '12	
Nelles, Douglas Henry	Ottawa, Ont.	Mar. 26, '81	Mar. 9, '07	
Nesham, Edward Williams	Ottawa, Ont.	June 10, '88	Mar. 15, '13	
Neville, Everett A.	Vancouver, B.C.	Jan. 8, '87	May 18, '11	B.C.L.S.
O'Hara, Walter Francis	Ottawa, Ont.		Feb. 19, '95	O.L.S.
Ord, Lewis Redman	Hamilton, Ont.	Oct. 17, '56	April 1, '82	O.L.S.
Palmer, Philip Ebenezer	Dorchester, N.B.	May 6, '88	Mar. 7, '12	
Parsons, Johnstone Lindsay R.	Regina, Sask.	Jan. 18, '76	Feb. 23, '65	O.L.S., S.L.S.
Patrick, Allan Poyntz	Calgary, Alta.	July 18, '49	Nov. 7, '77	B.C.L.S., D.T.S., A.L.S.
Patten, Thaddeus James	Little Current, Ont.	Feb. 4, '59	Mar. 29, '83	O.L.S.
Pearce, William	Calgary, Alta.	Feb. 1, '48	May 10, '80	O.L.S., B.C.L.S., A.L.S.
Pearce, Seabury Kains	Calgary, Alta.	Dec. 6, '87	Mar. 9, '11	A.L.S.
Pearson, Hugh Edward	Edmonton, Alta.	Oct. 17, '87	May 17, '12	A.L.S.
Pequegnat, Marcel	Berlin, Ont.	April 27, '86	June 6, '10	O.L.S.
Peters, Frederic Hatheway	Calgary, Alta.	Nov. 4, '83	Mar. 4, '10	A.L.S., Com. of Irrigation
Phillips, Edward Horace	Saskatoon, Sask.	Dec. 19, '78	Feb. 24, '02	S.L.S.
Phillips, Harold Geoffrey	Regina, Sask.	Sept. 3, '87	April 23, '10	S.L.S.
Pierce, Benjamin Clifford	Kingston, Ont.	Nov. 5, '90	Mar. 13, '14	
Pierce, John Wesley	Ottawa, Ont.	July 14, '85	Dec. 24, '09	O.L.S.
Pinder, George Zouch	Edmonton, Alta.	Mar. 5, '81	Mar. 15, '13	
Plunkett, Thomas Hartley	Meaford, Ont.	June 1, '78	Mar. 12, '68	
Ponton, Archibald William	Edmonton, Alta.	Jan. 25, '59	May 18, '81	O.L.S., A.L.S.
Powell, William Henry	Vancouver, B.C.	Dec. 22, '84	Feb. 22, '11	B.C.L.S.
Proudfoot, Hume Blake	Prince Albert, Sask.	June 23, '68	Mar. 28, '82	O.L.S., S.L.S.
Purser, Ralph Clinton	Windsor, Ont.	April 7, '86	Feb. 2, '11	
Rainboth, Edward Joseph	Ottawa, Ont.		May 19, '81	Q.L.S., O.L.S.
Ransom, John Thomas	Toronto, Ont.	Aug. 24, '88	Jan. 14, '11	O.L.S.
Reilly, William Robinson	Regina, Sask.	Aug. 10, '57	Nov. 17, '81	O.L.S., M.L.S., S.L.S.
Richard, Joseph Francois	Ste. Anne de la Po- catière, P.Q.		May 13, '82	Q.L.S.
Rinfret, Claude	Montreal, P.Q.	Jan. 5, '86	Mar. 20, '08	Q.L.S.
Rinfret, Raoul	Montreal, P.Q.	July 16, '56	Feb. 20, '00	Q.L.S.
Ritchie, Joseph Frederick	Prince Rupert, B.C.	May 23, '63	Jan. 7, '89	B.C.L.S.
Roberts, Sydney Archibald	Victoria, B.C.	April 10, '48	May 16, '85	B.C.L.S.
Roberts, Vaughan Maurice	Goderich, Ont.	Mar. 22, '64	May 17, '86	
Robertson, Donald Fraser	Ottawa, Ont.		May 25, '09	Dept. of Indian Affairs.
Robertson, Henry H.	N. Timiskaming, P.Q.	Sept. 13, '47	April 14, '72	Q.L.S.
Robertson, Edgar Doctor	Edmonton Alta.	Sept. 12, '85	Mar. 15, '13	
Robinson, Ernest Walter P.	Ottawa, Ont.	May 8, '80	May 1, '08	
Robinson, Franklin Joseph	Regina, Sask.	Oct. 20, '70	Feb. 20, '00	S.L.S., Deputy Minister of Public Works.
Robinson, William Andrew	Winnipeg, Man.	Feb. 21, '81	Oct. 2, '11	S.L.S. M.L.S.
Rolfson, Orville	Walkerville, Ont.	Feb. 26, '85	July 11, '68	
Rombough, Marshall Bedwell	Morden, Man.	Oct. 14, '35	April 14, '72	M.L.S.
Rorke, Louis Valentine	Toronto, Ont.	Feb. — '65	Aug. 13, '91	O.L.S., Inspector of Sur- veys for Ontario.
Ross, George	Welland, Ont.	June 12, '53	Nov. 21, '82	O.L.S.
Ross, Joseph Edmund	Kamloops, B.C.	Jan. 9, '61	Feb. 12, '91	O.L.S., B.C.L.S.
Routly, Herbert Thomas	Toronto Ont.	Jan. 20, '73	Feb. 15, '11	O.L.S.
Roy, George Peter	Quebec, P.Q.	Oct. 1, '52	Nov. 17, '81	Q.L.S.
Roy, Joseph George Emile	Quebec, P.Q.	Mar. 14, '86	May 25, '10	Q.L.S.
Russell, Alexander Lord	Port Arthur, Ont.		April 14, '72	O.L.S.
Saint Cyr, Jean Baptiste	Montreal, P.Q.	Dec. 17, '66	Feb. 17, '87	Q.L.S.
Saint Cyr, Arthur	Ottawa, Ont.	Nov. — '60	Feb. 17, '87	
Saunders, Bryce Johnston	Edmonton, Alta.	Oct. 17, '60	Nov. 16, '84	O.L.S.
Scott, Walter Alexander	Calgary, Alta.	Aug. 8, '85	Mar. 9, '09	A.L.S., S.L.S.
Seager, Edmund	Kenora, Ont.	Nov. 22, '38	April 14, '72	O.L.S.
Segré, Beresford Henry	Davidson, Sask.	Feb. 19, '86	May 8, '12	
Seibert, Frederick V.	Edmonton Alta.	Nov. 5, '85	Mar. 11, '11	O.L.S. S.L.S.
Sewell, Henry DeQuincy	Toronto, Ont.	April 18, '48	May 16, '85	O.L.S.
Seymour, Horace Llewellyn	Red Deer, Alta.	June 11, '82	Feb. 22, '06	O.L.S. A.L.S. S.L.S.

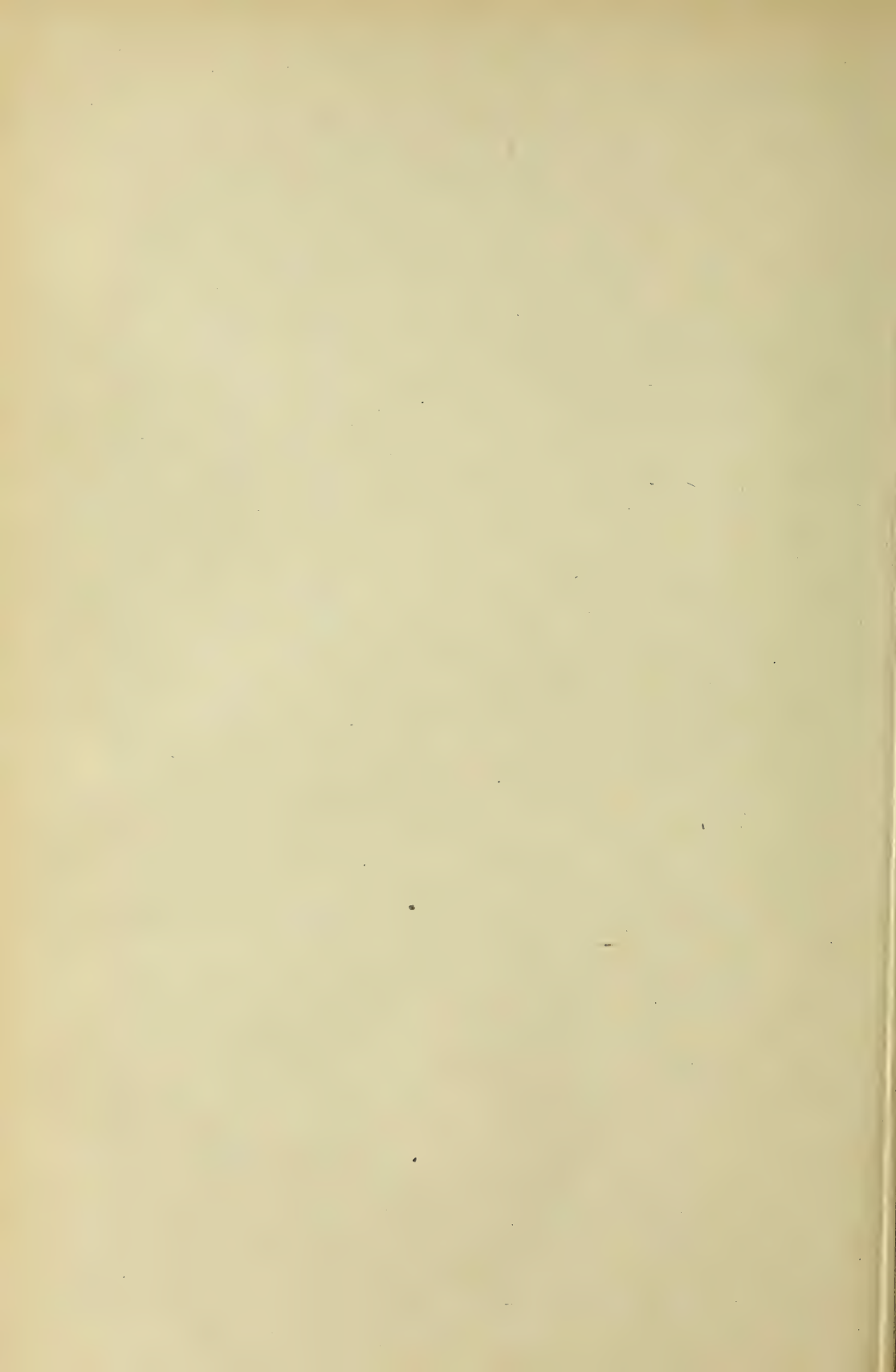


SESSIONAL PAPER No. 25b

APPENDIX No. 10—*Concluded.*LIST of Dominion Land Surveyors who are in possession of Standard Measures.—  
*Concluded.*

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Shaw, Charles Aeneas...	Greenwood, B.C.	Nov. 16, '53	May 10, '80	O.L.S., B.C.L.S.
Shepley, Joseph Drummond..	N. Battleford, Sask.	Sept. 13, '79	Mar. 12, '06	S.L.S.
Smith, Charles Campbell.....	Vancouver, B.C.	Jan. 1, '73	Feb. 22, '06	O.L.S.
Smith Donald Alpine.....	Regina, Sask.	Sept. 22, '80	April 21, '10	S.L.S.
Smith, James Herbert.....	Edmonton, Alta.	Nov. 9, '76	Feb. 23, '05	A.L.S., O.L.S.
Soars, Henry Martin Robinson	Edmonton, Alta.	April 22, '77	Nov. 2, '08	A.L.S.
Speight, Thomas Bailey.....	Toronto, Ont.	Feb. 8, '59	Nov. 16, '82	O.L.S.
Starkey, Samuel M.....	Codys, N.B.	Sept. 4, '37	April 14, '72	P.L.S. for N.B.
Steele, Ira John.....	Ottawa, Ont.	April 6, '81	April 16, '08	O.L.S. S.L.S.
Stewart, Elihu.....	Collingwood, Ont.	Nov. 17, '44	April 14, '72	O.L.S.
Stewart, Lionel Douglas N.....	Fort Frances, Ont.	Sept. 15, '83	Jan. 27, '10	O.L.S.
Stewart, Will Malcolm.....	Saskatoon, Sask.	Nov. 26, '84	June 6, '07	S.L.S.
Stewart, Louis Beaufort.....	Toronto, Ont.	Jan. 27, '61	Nov. 22, '82	O.L.S., D.T.S. Professor of Surveying and Geodesy, University of Toronto.
Stewart, Alexander George.....	Edmonton, Alta.	Aug. 16, '87	Mar. 14, '10	A.L.S.
Stewart, George Alexander.....			April 14, '72	O.L.S.
Stewart, Norman C.....	Vancouver, B.C.	Jan. 9, '85	March 7, '12	B.C.L.S.
Stock, James Joseph.....	Ottawa, Ont.	Aug. 16, '87	March 2, '10	
Street, Paul Bishop.....	Toronto, Ont.	Dec. 3, '81	Mar. 29, '10	
Stuart, Alexander Graham.....	Buckingham, P.Q.	July 16, '88	May 9, '11	
Summers, Gordon Foster.....	Haileybury, Ont.		Oct. 20, '10	O.L.S.
Swannell, Frank Cyril.....	Victoria, B.C.		May 10, '04	B.C.L.S.
Taggart, Charles Henry.....	Kamloops, B.C.		'83 May 9, '11	
Talbot, Albert Charles.....	Calgary, Alta.	April 5, '56	May 13, '80	A.L.S.
Taylor, Alexander.....	Portage la Prairie, Man.	Aug. 6, '75	June 9, '04	M.L.S., S.L.S.
Taylor, William Emerson.....	Toronto, Ont.	Aug. 3, '81	Dec. 16, '10	O.L.S.
Teasdale, Charles Montgomery	Moosejaw, Sask.	Oct. 18, '79	March 9, '06	S.L.S.
Thompson, William Thomas.....	Grenfell, Sask.	Nov. 1, '53	Nov. 19, '77	D.T.S., S.L.S.
Tipper George Adrian.....	Brantford, Ont.	July 25, '86	May 18, '11	A.L.S.
Tracy, Thomas Henry.....	Vancouver, B.C.	June 25, '48	April 14, '72	O.L.S., B.C.L.S.
Tremblay, Alfred Joseph.....	Montmagny, P.Q.		Feb. 18, '99	
Tremblay, Albert Jacques.....	Edmonton, Alta.	July 25, '87	March 1, '12	A.L.S.
Turnbull, Thomas.....	Winnipeg, Man.	May 26, '57	Mar. 29, '82	O.L.S.
Tyrrrell, James William.....	Hamilton, Ont.	May 10, '63	Feb. 16, '87	O.L.S.
Underwood, Joseph Edwin.....	Saskatoon, Sask.	Nov. 3, '82	May 18, '11	S.L.S.
Van Skiver, Leighton A.....	Fish Lake, Ont.		'74 May 13, '13	
Vaughan, Josephus Wyatt.....	Vancouver, B.C.	Oct. 17, '45	June 11, '78	B.C.L.S.
Vicars, John Richard Odium.....	Kamloops, B.C.	April 16, '55	May 17, '86	O.L.S., B.C.L.S.
Vickers, Thomas Newell.....	N. Battleford, Sask.	April 19, '96	May 17, '12	S.L.S.
Von Edeskyty, Joseph Otto.....	Vancouver, B.C.	Oct. 27, '84	March 3, '13	
Waddell, William Henry.....	Edmonton, Alta.	March 23, '83	Mar. 25, '07	O.L.S., A.L.S.
Waldron, John.....	Moosejaw, Sask.	Aug. 1, '72	April 2, '07	S.L.S.
Walker, Claude Melville.....	Guelph, Ont.	Oct. 16, '84	Mar. 11, '11	
Wallace, James Nevins.....	Calgary, Alta.	Aug. 21, '70	Feb. 20, '90	O.L.S., A.L.S.
Warren, James.....	Walkerton, Ont.	Nov. 7, '37	April 14, '72	O.L.S.
Warrington, George Albert.....	Winnipeg, Man.	'83 Mar. 15, '13		M.L.S.
Watt, George Herbert.....	Ottawa, Ont.	Feb. 5, '76	Feb. 24, '02	
Wauga, Bruce Wallace.....	Ottawa, Ont.	March 24, '88	May 28, '12	
Weekes, Abel Seneca.....	Edmonton, Alta.	Feb. 17, '66	Feb. 11, '92	A.L.S., S.L.S., O.L.S.
Weekes, Melville Bell.....	Regina, Sask.	Nov. 28, '74	Feb. 18, '03	O.L.S., S.L.S.
Wheeler, Arthur Oliver.....	Sidney, B.C.	May 1, '60	Nov. 21, '82	O.L.S., B.C.L.S., M.L.S., A.L.S.
White-Fraser, George W. R. M.	Victoria, B.C.		'61 Feb. 21, '88	D.T.S., B.C.L.S.
Wiggins, Thomas Henry.....	Saskatoon, Sask.	Aug. 24, '63	Feb. 18, '96	O.L.S., S.L.S.
Wilkins, Frederick W. B.....	Norwood, Ont.	June 27, '54	May 18, '81	O.L.S., D.T.S.
Wilkinson, William Downing	Hamilton, Bermuda.	Mar. 22, '64	Feb. 22, '93	
Williams, Goy Lorne.....	Enderby, B.C.	March 3, '79	June 24, '08	B.C.L.S.
Wilson, Reginald Palliser.....	Winnipeg, Man.	July 9, '72	Jan. 26, '11	M.L.S.
Woods, Joseph Edward.....	Pincher Creek, Alta.	Oct. 13, '61	Nov. 14, '85	A.L.S.
Wrong, Frederick Hay.....	Windsor, Ont.	Aug. 22, '86	May 18, '11	
Young, Stewart.....	Regina, Sask.	Sept. 2, '84	May 17, '13	S.L.S.
Young, Walter Beatty.....	Winnipeg, Man.	July 6, '80	Mar. 25, '05	M.L.S.
Young, William Howard.....	Calgary, Alta.	June 8, '78	May 17, '07	A.L.S. District Engineer

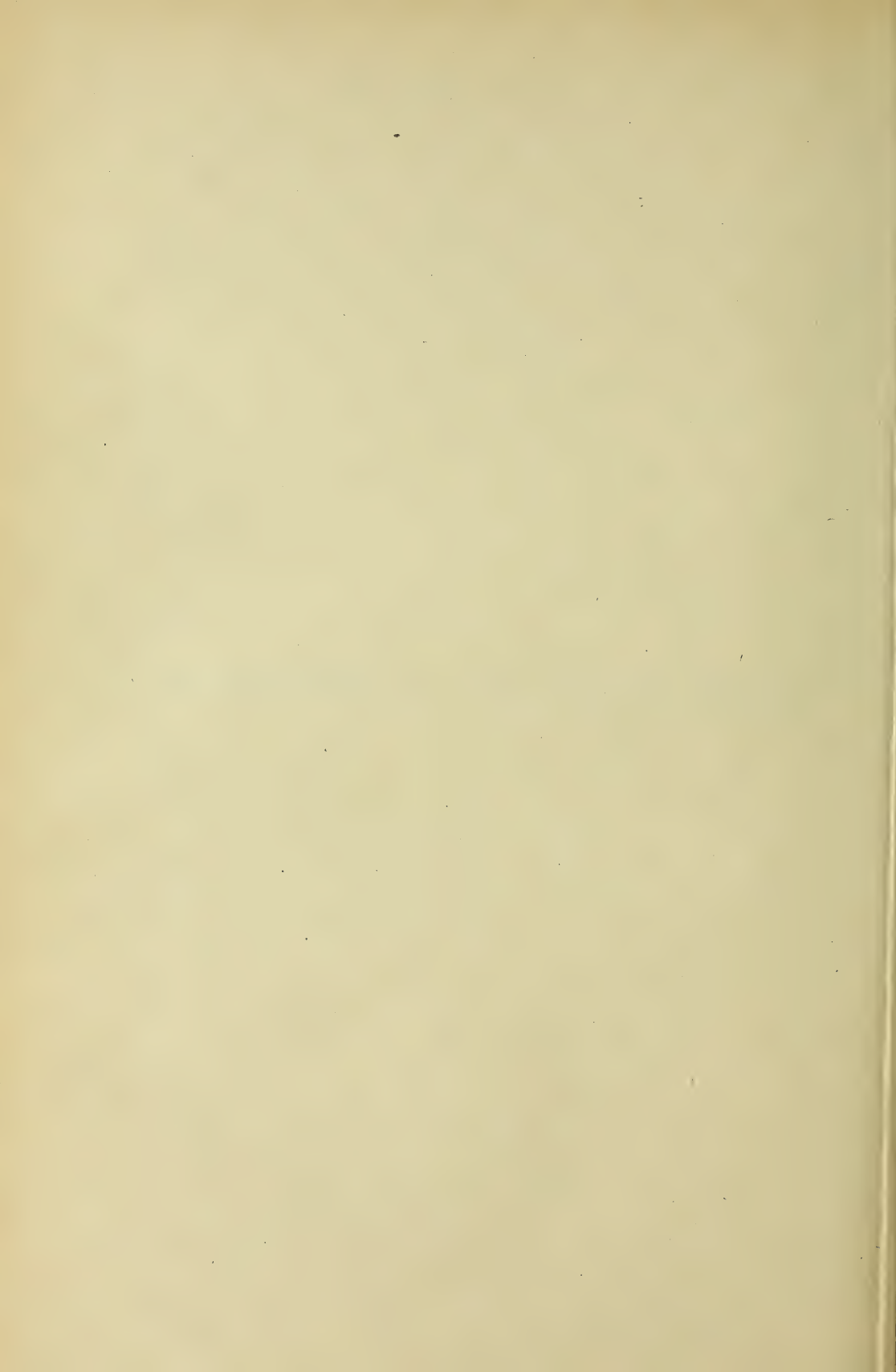






# REPORTS OF SURVEYORS.







SESSIONAL PAPER No. 25b

## GENERAL REPORTS OF SURVEYORS

1913-1914

## APPENDIX No. 11.

## REPORT OF J. R. AKINS, D.L.S.

BASE LINE SURVEYS IN THE VALLEY OF PEACE RIVER.

OTTAWA, March 2, 1914.

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa, Canada.

SIR,—I have the honour to submit the following report on the survey of the meridian outline between ranges 21 and 22, from the 23rd to the 24th bases and parts of the 24th, 25th, 26th, and 27th bases, all west of the fifth meridian.

I left Edmonton with my party on February 28, 1913, and reached Peace River Crossing on March 13. The route followed was by the Canadian Northern railway to Athabaska, up Athabaska river to Mirror landing, up Little Slave river and over the portage to Lesser Slave lake, across the lake to Grouard, and from there to Peace River Crossing by trail.

Hay was known to be very scarce along Peace river on account of the dry weather and fires during the previous season. It was therefore decided to haul the hay from Grouard, a distance of eighty-five miles. Most of the packhorses would work in harness, so when we were at Grouard, extra sleighs were purchased and used for freighting, each team hauling about a ton.

At Peace River Crossing arrangements were made with the Peace River Trading and Land company to have a scow ready to take supplies down stream to the work as soon as navigation should open. This scow was later used for moving the party and supplies between bases. In the fall it was brought up to the Crossing, loaded with supplies, horses, sleighs and oats and sent down to Vermilion. This scow was built very strongly with a flat bottom and square ends and carried about twelve tons.

In the meantime as the starting point of the work was about thirty-five miles down stream from Peace River Crossing, the outfit was hauled down the river and afterwards the teams were used hauling freight from the Crossing while the main party commenced work on the meridian outline which ran nearly parallel to the river and about five miles west of it. As the snow was still deep in the woods the cache was left on the river, and was moved down as the work proceeded.

As the line advanced trails were cut from the river to intersect it, and on these trails supplies were brought from the river to the camp. When the ice began to melt the cache was moved down to where the 24th base was expected to cross the river and placed on the east side of the river. All but ten of the horses were also put on the east side. This necessitated making two trips each day camp was moved while working west of the river, but it eliminated the risk of transportation being stopped by running ice when the survey of the 24th base line should reach the river. This proved to have been a wise precaution, for when the river was reached on April 19 the ice, although strong enough in the morning to chain over, broke up in the afternoon. The river was open along the west shore, and as the horses could not cross, a



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canoe was used to get the camp from the shore to the ice. Several men were engaged in getting it across when the ice began to move. They had considerable difficulty in getting the outfit off the moving ice, but nothing was lost. It is a fine sight to see the ice on those northern rivers go out. It is of great thickness and when a jam occurs great blocks roll up on the shore.

The northeast corner of township 92, range 18, was reached on May 5 with forty-nine miles of line run. Here we met Mr. J. A. Fletcher, D.L.S., with his party, and the two parties working together produced the meridian outline to the 25th base, where the parties separated. After twelve miles of this base had been run Peace river was reached again. The water was now very high and driftwood was running so thick that the Hudson's Bay company would not take the horses across in their boats. As the horses could not swim, the twelve miles on the west side of the river was done by man packing, after which the party was moved to the 26th base. When eighteen miles of this was run the outfit was again moved north and work commenced on the 27th base. I was instructed to run this line far enough west to establish a township corner on the west side of the river. One range was found sufficient for this, after which the line was produced eastward.

On receiving your telegram of August 6, stating that some of the horses should be wintered at Fort Vermilion, I endeavoured to get one of the settlers to take charge of them for the winter, but they claimed that it was too late in the season to get sufficient hay cured. I therefore hired a wagon, mowing machine and rake, and left a small party at Buffalo Head prairie to put up hay while the remainder continued on the line. On account of the wet fall weather and the short days considerable difficulty was found in curing the hay, but in about a month one hundred and thirty loads were gathered. The horses are wintering there, two men being in charge. They have built stables and a shack and by their latest reports the horses are doing well.

On September 26 we reached Wabiskaw river. Up to that time we had independently completed 147 miles of line. On the following day the party started for Fort Vermilion. Previous arrangements had been made with the Hudson's Bay company by which they promised to have their last boat leave Vermilion on October 1, that being the latest date on which they said they would risk starting up stream as they were afraid of meeting running ice. When the arrangement was made much stress was laid on the fact that they were not to keep us waiting. The later the appointed time of starting the better, if they were sure to start on the day appointed. I offered to contract with them that I would pay any expense which they would incur if I kept them waiting providing they would pay ours if we had to wait on them. They would not make this contract but assured us that they would leave at the time appointed. This trip was arranged especially for the surveyors in the country, we having guaranteed to give them a certain number of passengers and freight. But when we got to the Fort no boat had yet arrived. We waited four days and then decided that we would wait no longer as an accident might have happened to the boat, and if we stayed longer we might be unable to get out, which would place us in a serious position as there was only a limited amount of supplies.

A scow was fitted up, and on October 3 we started tracking up the Peace. On the 6th we met the boat coming down. Six days later it picked us up and we arrived at the Crossing on the 16th.

Owing to the wet season the trail to Grouard was in a very bad condition. As high as seven cents per pound was being paid to get freight across, and it was difficult to get freighters to make the trip. We were therefore fortunate in getting two teams to go the day after we arrived. The progress was very slow because of the mud and water. On the 21st information was received that the lake boat had just come to Grouard and would leave the following morning. If this boat was missed it would be about a week before another would leave, and if the weather turned cold we might not get one at all. It was therefore decided to travel at night and Grouard was reached



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at three o'clock in the morning. The boat transported the party to Soto landing. From there the party walked to Mirror landing, while the baggage was brought over in wagons. From Mirror landing to Athabaska the transportation was by scow. Edmonton was reached on October 28.

*Route.*

Settlers can get to Peace river any time of the year, but the month of March is the best. At that time of the year the trail is generally good and the weather not very cold. There are stopping-places all along the way which have bunk-houses for the travellers and stables and feed for the horses, but each person must carry his own blankets. At other times of the year the trails are often in a very bad condition, but it will only be a couple of years before the railroad will have reached Peace river.

In summer it is easy to get from Peace River Crossing to Fort Vermilion. A settler can build a raft, pile on his effects and quietly float for a distance of 330 miles, at a rate of from two and a half to four miles an hour. There are three ways of getting out from Fort Vermilion: (1) by boat, (2) by tracking up the river when the water is low, (3) by a pack trail which connects Fort Vermilion with the Crossing. This trail is on the northwest side of the river and is in places about forty miles from it.

There are two boats on the river: one owned by the Hudson's Bay company and one by the Peace River Trading and Land company. The latter company's boat was compelled to tie up the greater part of last summer on account of the boiler bursting. These boats run a freight and passenger service from Vermilion chutes to Hudson Hope. The following is the tariff:—

Distance in Miles.	From Vermilion chutes to	Freight Tariff per 100 lbs.		Passenger Tariff each person.	
		Up.	Down.	Up.	Down.
		\$ cts.	\$ cts.	\$ cts.	\$ cts.
50	Fort Vermilion .....	1 00	0 75	5 00	2 00
330	Peace River Crossing .....	4 00	1 75	30 00	17 00
400	Dunvegan .....	5 00	2 50	40 00	22 00
530	Fort St. John .....	7 00	4 00	55 00	32 00
570	Hudson Hope .....	9 00	6 00	65 00	37 00
240	Chipewyan .....	3 00	1 50	30 00	20 00

A good road would greatly assist in settling the country. A road from Athabaska via Wabiskaw to Fort Vermilion is now under consideration by the Provincial Government. If a road were built on the northwest side of the river from Peace River Crossing to Fort Vermilion it would make most of the good country accessible.

*Description of Country.*

Almost the entire valley of Peace river, consisting of a strip from thirty to sixty miles wide, is suitable for settlement. The west side of the river has the larger proportion of good soil. The land could be easily cleared as it is generally lightly wooded with spruce, poplar and scrub, and there are also many open patches which grow fine hay.

The 27th base enters a prairie in range 15. This prairie is not large but it grows an abundance of peavine and blue-joint which makes the best of horse feed, and there is no difficulty in cutting it with a machine. About one and a half miles south of the



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base in range 10, there is a much larger prairie, about four miles wide and twenty long. Between these two prairies the line passes through a peculiar country. When heavy rains fall much of it becomes flooded and large streams which have their source in the Buffalo Head hills suddenly spread all over the country. In the first part of their course they have well-marked channels but when they spread out there is no channel whatever. It was very disagreeable work running this part of the line as there had been heavy rains on the Buffalo Head hills and we had to work knee-deep in the cold water for several miles. A few miles north of the base line this water is all collected by Bear river. On the east side of Loon river there is little feed, the country being mostly covered with moss. A full description of the different parts of the country is shown on the sketch map which accompanies this report.

#### *Resources.*

Agriculture will probably be the chief industry of the country. Farming has been tried many places around Fort Vermilion with considerable success. Mr. S. Lawrence, who has been in the country for many years, finds farming a paying proposition. He has three hundred head of cattle, seventy-five horses and one hundred pigs. Last year he raised over three thousand bushels of wheat, besides oats and barley. He sells the wheat at one dollar and a half a bushel, and it is ground at the Fort. The Hudson's Bay company have a modern electrically lighted flour mill; the flour is either used in the vicinity or shipped to the northern ports.

The experimental farm in charge of Mr. Jones suggests wonderful possibilities for the country, and leads to the conclusion that it will be only a short time before the whole valley will be settled with prosperous farmers.

There were no minerals seen during the season except traces of gypsum.

There will be enough timber to supply the needs of the settlers but not enough to be of any commercial value.

#### *Game.*

Game is quite plentiful, moose abounding in the vicinity of the Buffalo Head hills. Bears are also plentiful, and in the fall many were seen along Peace river, where they come to look for berries. Prairie-chickens and several species of grouse were noticed, but they were not very plentiful.

#### *Fur.*

There are many fur-bearing animals in the country, consisting of foxes (black, silver, cross and red), mink, marten, weasels and some beavers. The last mentioned are not very numerous at present, but the work which they have left shows that they have been very plentiful in the past. On the Buffalo Head hills there are quite a few timber wolves, and in very severe winters these come down to the plains to look for food.



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The following is a record, obtained from the Hudson's Bay company at Fort Vermilion, of the conditions of the river at that place for the last twenty-four years:—

Year.	Ice starts moving.	First crossing in open water.	Ice starts drifting.	First crossing.	Year.
1890	May 4	May 8	Nov. 16	Nov. 30	1890
1891	Apr. 23	" 1	Oct. 29	" 12	1891
1892	May 11	" 15	Nov. 4	" 8	1892
1893	" 3	" 10	Oct. 31	" 4	1893
1894	Apr. 29	" 6	Nov. 1	" 10	1894
1895	" 25	Apr. 29	" 7	" 15	1895
1896	May 2	May 5	" 7	" 10	1896
1897	Apr. 20	Apr. 26	Oct. 10	" 1	1897
1898	" 23	" 27	" 27	" 1	1898
1899	May 5	May 10	" 20	" 12	1899
1900	Apr. 14	Apr. 20	Nov. 4	" 15	1900
1901	" 26	May 3	" 2	" 6	1901
1902	May 1	" 6	" 4	" 8	1902
1903	" 3	" 13	" 11	" 19	1903
1904	Apr. 17	Apr. 24	" 16	" 30	1904
1905	" 27	" 30	Oct. 23	" 1	1905
1906	" 20	" 22	Nov. 10	" 16	1906
1907	May 6	May 13	" 8	" 13	1907
1908	Apr. 30	" 6	Oct. 28	" 2	1908
1909	" 20	Apr. 22	Nov. 5	" 13	1909
1910	" 25	" 28	" 1	" 9	1910
1911	" 29	May 3	Oct. 31	" 9	1911
1912	" 29	" 1	Nov. 1	" 9	1912
1913	" 25	" 2			1913

I have the honour to be, sir,

Your obedient servant,

J. R. AKINS, D.L.S.



## APPENDIX No. 12.

## ABSTRACT OF THE REPORT OF C. F. AYLSWORTH, D.L.S.

## RESURVEYS IN MANITOBA.

I organized my party and procured my outfit at Winnipeg, and on May 5 I left by the Canadian Northern railway for Eriksdale. My first work in this district was to determine the necessity for a resurvey of township 21, range 3, west of the principal meridian.

I next began the resurvey of township 22, range 4. This township is rather stony, but wood for fuel and building material is plentiful. When the stones are removed the soil will be excellent for any desired purpose. There are a number of settlers in the township but as yet the majority of them have not made much progress toward the cultivation of their land. We completed this resurvey on August 1. We then began the resurvey of township 23, range 5.

We experienced some difficulty in this survey owing to the many large and small floating muskegs in this township. The high land is rather stony, but there is an abundance of fuel and building material to be had. The hay in the numerous sloughs is of a poor quality and affords a barely sufficient supply for the present requirements. There are a number of new settlers of a good class, but they have not made much progress yet. When the stones are removed the soil will be good for mixed farming. A number of people were looking for homesteads in this township while we were there.

The northeast quarter of this township abounds with game such as moose, deer and elk, but it is doubtful if many of them will remain there after this winter's hunting.

The past season was dry, and as there are not many wells in the district it was difficult to obtain water for domestic purposes, but this disadvantage can be remedied as the water to be obtained from this soil is excellent.

On September 20 we proceeded to township 16, range 6, east of the principal meridian, to complete the resurvey of the township. We then returned to township 21, range 3, west of the principal meridian, and proceeded with the resurvey of this township.

The progress of our work was expedited by the early freeze-up, and we were able to travel on the ice as early as October 20.

The land in this township is stony, and I would estimate that about 50 per cent of it is muskeg and water. There is some good land in the northeast quarter of the township. An abundance of wood for fuel and building purposes and considerable first-class hay is to be found. The township lies about midway between the Oak Point and the Grosse Isle branches of the Canadian Northern railway, and the locomotive whistle from each branch can be heard in this township.

Old timers inform me that much of the comparatively high land is liable to be flooded by excessive rains, and that years ago a number of settlers who lived there were compelled to leave and abandon their homes. The many abandoned shacks and clearings we saw bear mute testimony to the correctness of this information. There are, however, many desirable homesteads in the northwest quarter of this township.

We completed our work in this township on December 2, after which I disbanded the party, made the necessary arrangements for wintering the outfit, and left for home, where I arrived on December 10.



## APPENDIX No. 13.

## ABSTRACT OF THE REPORT OF P. R. A. BELANGER, D.L.S.

## INSPECTION OF SURVEY CONTRACTS IN SASKATCHEWAN.

I began the organization of my party at Prince Albert on Monday, May 12, 1913, and after spending a week in hiring men, buying supplies and securing my transport outfit from Henribourg, I shipped the whole outfit by rail to Dumble, a siding on the Big River branch of the Canadian Northern railway.

From Dumble we drove easterly for nearly three days over a trapper's road, meandering around numerous lakes and sloughs before we reached township 55, range 5, west of the third meridian, where we pitched camp on the north bank of Sturgeon river.

Our work there consisted of the inspection of contract No. 19 of 1912. This contract comprises township 54, range 5, and townships 55 and 56, ranges 4 and 5, and covers a hilly country which is situated at the height of land between watercourses running southerly to the Saskatchewan and northerly to Montreal lake.

The land is still generally heavily timbered, but small openings are found along Lofthouse creek in township 55, range 5, while larger ones are found in township 54 of the same range along Sturgeon river, where good homesteads can be located. Scattered mixed farms could be established at intervals along the streams above mentioned or in the vicinity of a few lakes where hay is found in fairly large quantities. This country can be reached from the west by the road we followed, or from the east by the surveyors' road, branching in township 56, range 1, from the Prince Albert-Montreal lake trail.

From this contract I proceeded on June 10 westerly to contracts Nos. 31 and 32 of 1912. I followed the Green lake trail to Witchekan lake and from there to Edam, a small town on the Canadian Northern railway northwest of Battleford, where I secured supplies before continuing my journey northerly via Brightsand and Makwa lakes.

The road which I followed from Witchekan lake to Brightsand lake passes through thriving settlements where farmers were busy breaking land or seeding; but from Brightsand lake northwesterly the road enters a bush country which extends to Makwa lake and which is unoccupied, except in the northern part of township 57 and the southern part of township 58, range 21. There a few settlers are found and a few more could settle to advantage. This applies also to the lands at Makwa lake, where good mixed farming could be carried on. Hay grows in large quantities and the land is of first quality.

From Makwa lake I followed a surveyor's trail northerly to the south bank of Beaver river, and by cutting a small piece of road down the bank I reached the river flat and crossed the river in section 6 of township 61, range 22, on a strong raft which I built for that purpose. From that crossing, by cutting about three miles of road northerly I found the surveyor's road which leads through both contracts.

The inspection of these two contracts kept the party busy from July 1 to the 30th, both days inclusive. The country covered by these contracts comprises townships 62 and 63, range 21, townships 61, 62 and 63, ranges 22 and 23, and townships 63 and 64, range 24, west of the third meridian. With the exception of a practically clear opening extending east and west in the centre of township 62, range 22, where a small colony of settlers could locate at once to advantage, the townships inspected are more or less timbered and need clearing.



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This part of the country can be reached by the road which I followed but better roads are found running due north from Fort Pitt. Upon one of these a ferry was established last summer, crossing Beaver river. It is also easily reached from Cold lake by an Indian trail running easterly to Lac des Isles and Waterhen lake. Good milling spruce is found along the road in township 62, range 23, near Lac des Isles. This lake abounds with fish.

On July 31, not knowing of any short road which would take us directly to our next work, the inspection of contract No. 28 of 1912, in townships 63 and 64, range 16, and townships 62, 63 and 64, range 17, west of the third meridian, we returned to Makwa lake, whence we followed an Indian trail branching easterly to Meadow lake. Before reaching the latter place we passed through a belt of exceedingly rich land which is occupied by only a few ranchers.

From Meadow lake we followed the Green lake trail northerly and northeasterly for about twelve miles and thence branched off to Morin's ranch in the valley of Beaver river where we crossed the river with a row-boat, and entered contract No. 28.

The country we passed over in this contract may be described as heavily timbered and unfit for immediate settlement, though the land is fair; but at "the narrows," on the north shore of Waterhen lake, as well as along Waterhen river near where it empties into the lake, are found stretches of meadow land where large quantities of hay can be obtained. A few families of Indians were the only inhabitants we met in this country; they live on game and fish which is abundant in the vicinity. They are great believers in offering guns, rifles and material of all kinds to the great Manito for the success of their hunting excursions. They appeared very anxious to know whether they would be disturbed in their wilderness by settlers who might take their land. This district is reached by the road we followed or by an Indian trail from Cold lake to the west side of Waterhen lake.

On August 19, having completed the inspection of contract No. 28 I proceeded to my next work, the inspection of contract No. 23 of 1912, comprising townships 53 to 56, range 13, and township 56, range 12, west of the third meridian. This country was reached by following a long circuitous route via the Battleford-Green lake trail from Meadow lake to Birch lake, and thence by the Chitek lake trail to township 53, range 13, where we commenced work.

Fifteen days were occupied in the full inspection of four townships out of the six comprised in this contract. The Battleford-Chitek lake trail runs across a large meadow in townships 53 and 54, range 13, where thousands of tons of first class hay can be cut, principally near the southern end of Chitek lake where a large dairy industry could be established with great advantage. This place is used by a rancher from Rabbit lake, as winter quarters for his cattle. The eastern half of township 53, as seen along the road, is very suitable for mixed farming though in need of clearing. Good soft water is found in creeks and in Chitek lake which is full of whitefish, jackfish and pickerel.

Having completed the inspection of contract No. 23 we entered contract No. 22 in range 12, on September 15, to make the inspection of the part of the contract surveyed. In passing Boutin post office, however, I received instructions to limit my operations in this contract to the inspection of the monuments marking corners in townships 55 and 56, range 11. I therefore temporarily abandoned this inspection, and proceeded to contract No. 20 of 1913, comprising townships 57 to 60 inclusive, range 15, and two-thirds of township 60, range 14.

To reach this work we followed an old branch of the Battleford-Green lake trail along the east shore of Chitek lake as far north as the north end of the lake where we branched off westerly by cutting a road which took us to section 4 of township 57, range 15, where we set up camp on the north bank of Alcott creek. This new road crosses several creeks along which are found good hay meadows which would warrant



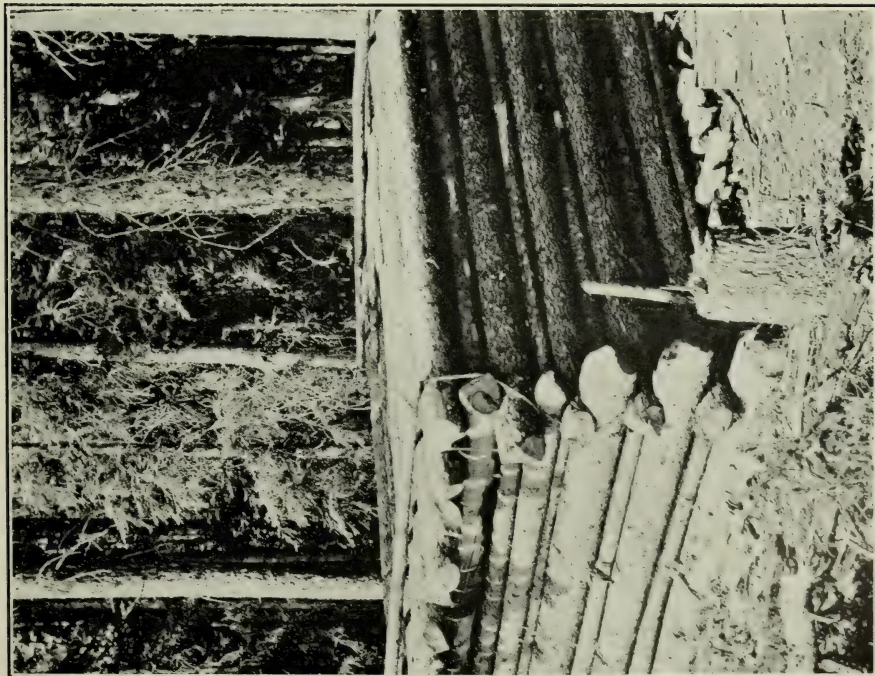


Photo by J. A. Fletcher, D.L.S.  
Survey Cache on Peace River in Township 105.

These caches are built at convenient points, as near as possible to the place where the survey line will run. Supplies are then hauled in winter, when transportation is easiest, and deposited in these caches for use by the survey party when running the line. The floor of the cache consists of poles on which the supplies are laid, except the bacon which is always hung up. The walls are clinched and the supplies are covered with heavy canvas to keep off the rain. A covering of poles is then wired on to keep off bears and other predatory animals. Supplies are kept thus for months without being damaged.

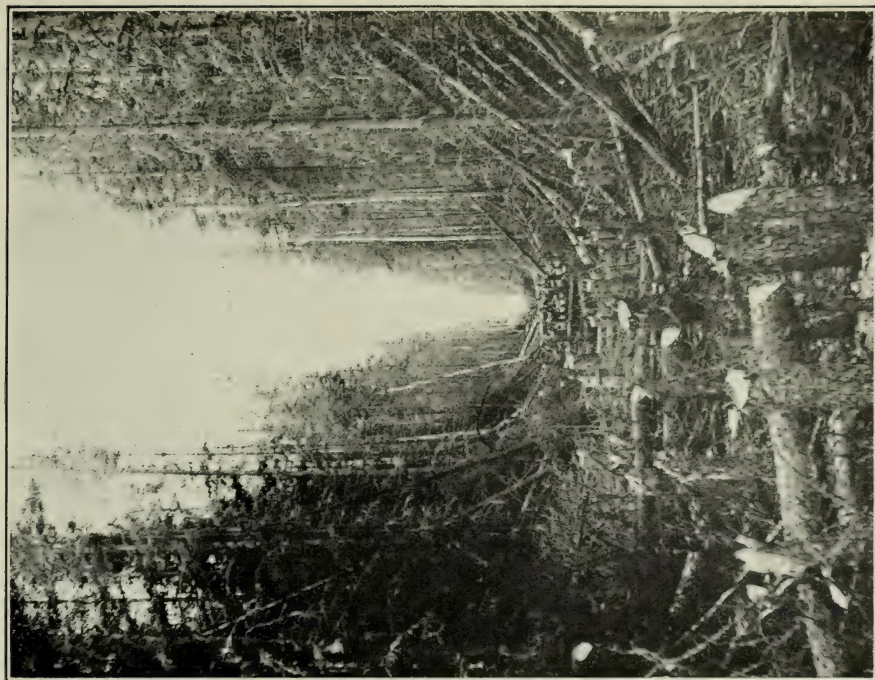
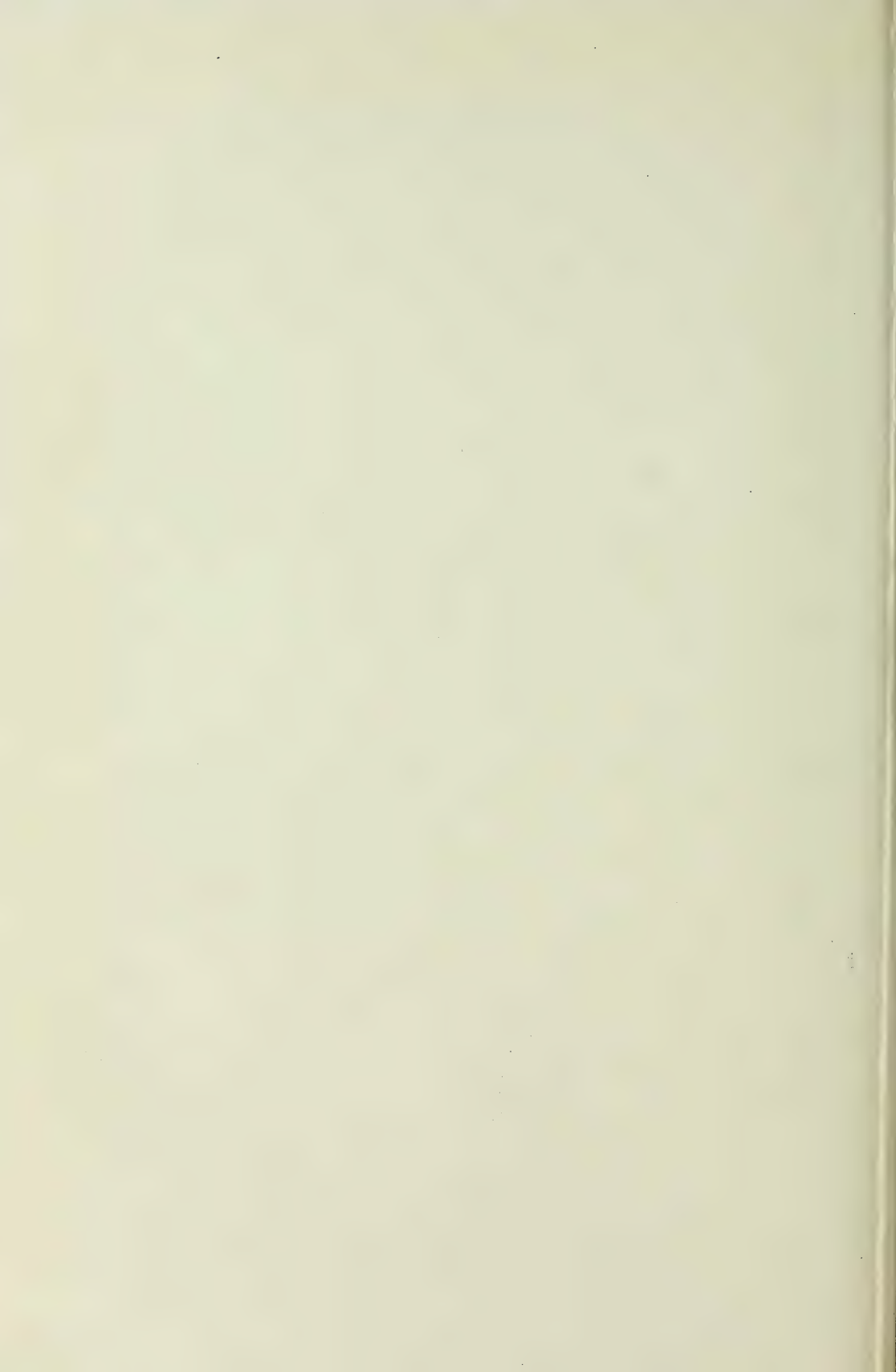


Photo by J. A. Fletcher, D.L.S.  
Twenty-seventh Base Line in Range 22, West of Sixth Meridian.

Small poplar and spruce cover a great portion of the Peace river valley, but many open prairie patches are found and the soil is good. The bush land would not be difficult to clear as the timber is small.







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the establishment of a few mixed farms. The remainder of the country along this road, as well as in contract No. 20 is, with the exception of a few small openings in the valley of Alcott creek, more or less heavily timbered and broken by extensive muskegs, and consequently not fit for immediate settlement.

The only way to enter this part of the country with wagons at present is by following the road which we used, but it could also be reached from Meadow lake by an Indian pack trail along which a wagon road could easily be cut.

On October 8, having completed the inspection of contract No. 20, we returned from range 15 to range 12 to complete the subdivision of townships 54 and 55, range 12, and also to continue the inspection of contract No. 22, in townships 55 and 56, range 11. This inspection and the subdivision work in the two townships above referred to kept the party busy until November 29. The whole of township 55 was completely subdivided, while in township 54 our work was limited to the survey of the north boundary of the township, together with the tier of sections adjoining it on the south side. This fractional part of township 54 as well as the two southern tiers of sections in township 55, is all rolling country, timbered with a second growth of poplar, birch and willow, partly dry and easy to clear for immediate settlement. The land is fair and well watered by marshes and several lakes, the largest being Chitek lake which encroaches on sections 5, 6, 7, 8, 17, 18 and 19 of township 55, and section 31 of township 54; this lake abounds with fish of all kinds.

The remainder of township 55, range 12, is more or less heavily timbered. The soil is light and generally unfit for immediate settlement, but the timber can be used for building purposes, railway ties, and cordwood.

With the exception of the northern tier of sections, township 54 forms part of contract No. 22 which I inspected, and may be described as open and generally suited for farming purposes in the eastern half, but the western half is more timbered and broken by muskegs, which render it unsuitable for immediate settlement. The south-east quarter of this township, as well as the northeast quarter of township 53, is occupied in summer by a rancher of the south settlements, who brings his cattle in to fatten them for the market.

On November 10, owing to the serious illness of my wife, it became necessary for me to return home. My party was left in charge of Mr. E. W. Hubbell, D.L.S., for the remainder of the season.

Before closing my report I would like to make special mention of the valley of Beaver river, which has in the past been the breeding home of the industrious animals from which it derives its name, and which by their yearly damming of the river have converted its valley into immense hay meadows where dairy farmers and ranchers can secure thousands of tons of the very best hay, principally on the west side of the mouth of Meadow creek, where a few small ranchers are already located. I cannot emphasize too strongly the great advantage offered in this river valley to settlers who do not care far grain cultivation. For those in search of mixed farming land, I would recommend the country in the vicinity of Meadow lake.

No minerals of any kind were found during the survey, but large game, such as moose and deer, is still plentiful, and partridges, ducks and rabbits are abundant. Good water is also found everywhere.



## APPENDIX No. 14.

## REPORT OF G. A. BENNETT, D.L.S.

MISCELLANEOUS SURVEYS IN MANITOBA, SASKATCHEWAN, AND ALBERTA.

TILLSONBURG, ONT., January 14, 1914.

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa, Canada.

SIR,—I have the honour to submit the following report upon the miscellaneous surveys performed by me in the provinces of Manitoba, Saskatchewan, and Alberta, during the past season.

These surveys were very varied in character. They consisted in restoring and re-establishing obliterated and lost monuments, traversing lakes and rivers whose beds and channels have considerably altered since the original survey, surveying the beds of lakes which have dried up and yielded many acres of valuable hay and farm land, making original surveys of coal-mining leases and park boundaries, destroying duplicate and river-lot monuments, investigating various matters in connection with the survey of Dominion lands and locating and correcting where possible, errors in original surveys, under the provisions of section 57 of the Dominion Lands Surveys Act. When it was found impossible to alter the original surveys, retracement surveys were made to obtain a true record of the metes and bounds of the lands as defined by the misplaced monuments of the original survey, so that the areas could be shown correctly upon the official plans.

The field operations were begun by a resurvey of part of township 18, range 18, west of the third meridian, to correct a small error in the original survey. Township 15, range 2, west of the third meridian, was next visited to investigate reported errors in the original survey. Large errors were found affecting much of the township, so upon petition of the settlers and with the consent of all the owners affected, a correction survey was made. Valuable improvements were thereby affected, as the boundaries of several improved quarter sections were moved over forty rods. To make a peaceful adjustment of the various claims, the settlers held a meeting one evening and upon their request, I attended. There I explained the provisions of the law, as contained in the Dominion Lands Surveys Act, and gave authoritative statements of the various improvements changing ownership from the correction of the survey, thus preventing exorbitant demands. After considerable discussion, a friendly settlement of their claims was effected. Agreements, in writing, were then drawn up stating definitely the payment to be made in each case, and these were signed by the parties interested.

Small retracement surveys were next made, in township 19 A, range 1, west of the second meridian, to destroy a false duplicate monument; in township 18, range 20, west of the principal meridian, to investigate the position of a section corner as defined by a witness monument of a recent survey, and to correct the error found; and in township 20, range 22, west of the principal meridian, to investigate and verify the position of a section corner as defined by a witness monument of a recent survey. These townships are wooded and are settled by Ruthenians and Galicians. Rapid progress has been made by these industrious settlers in clearing their farms and to-day they are building modern dwelling houses with large barns, and they possess fine horses and many cattle.



## SESSIONAL PAPER No. 25b

On June 25, a resurvey was begun in township 16, range 2, west of the third meridian, upon a petition of the settlers there. A complete correction of the known errors in the survey of this township was made, and payment for transferred improvements was agreed upon by the owners interested.

An investigation of reported errors in township 7, range 10, west of the second meridian was then made. In this township very large discrepancies were found in the original survey. Most of the township was retraced and the largest errors corrected, consequently some improvements of small value changed ownership. The original survey was so erroneous (some of the monuments being one-quarter of a mile from where they should have been) that the settlers had disregarded the old survey monuments and divided the land as equally as they could among themselves.

As much of the land in this township is held by absentee speculators, the settlers are few and scattered. Little progress has been made in road building or the drainage of numerous sloughs, so that it was difficult to drive across the township last year after the June rains. The municipal authorities informed me that they had hesitated to build roads on account of the crookedness of the section lines arising from errors in the original survey, but that the accumulated appropriations for this work would be spent immediately upon the resurveyed road allowances. This district is noted for its rich clay loam soil, and the fact that fine crops have been obtained over a term of years is attested to by the fine buildings and stock of the prosperous farmers.

According to the Dominion Lands Surveys Act the consent of all owners of lands affected must be obtained before a resurvey may be made to correct the original survey. Generally all resident owners are anxious to have an erroneous survey corrected, but the indifference and suspicion of absentee owners render it difficult to carry out the wishes of the settlers. When the errors in the survey are discovered before improvements have been made or lands patented, the corrections are usually readily accomplished.

On July 23, I retraced the north boundary of Katepwe park in township 20, range 12, west of the second meridian and restored the boundary monuments. Mr. Norman Ross, chief of the Tree Planting Division, Indian Head, who has charge of the park, requested me to also survey the east boundary. However, as this necessitated the measurement of several lines across Katepwe lake, which was impracticable at this season, the survey was not completed until December, when the lake had frozen. On the surveyed boundaries of the park, fences have now been erected to preserve to the people of eastern Saskatchewan, the beautiful shady groves along the lake, which render this place so attractive. Several hundred people were enjoying themselves there during July and the park is certain to become more popular when people learn of its existence.

I proceeded to Alberta on July 29 and began the retracement of both sides of the fifth correction line through ranges 9, 10 and part of 11, west of the fourth meridian, to ascertain the extent of the errors in the outline surveys. This district has been recently homesteaded and the dry weather in June rendered the settlers' crops on new breaking poor. However, the farmers, who had started into mixed farming were not complaining and their stock looked well.

The survey of the boundary of the Rocky Mountain Forest reserve through townships 1, ranges 28 and 29, west of the fourth meridian, was next completed. It appears that most of this rough country had once been covered with forest, but bush fires have denuded many of the mountain slopes. Much fine grazing land has resulted and cattle by the hundred and sheep by the thousand were noticed feeding upon the rich pasturage near and in the forest reservation. The cattle were doing little injury to the forest growth, but the sheep were destroying most of the vegetation and so largely preventing reforestation.

The traverse of the banks, by-channels and islands of Bow river through sections 13 and 14, township 24, range 1, west of the fifth meridian, was completed by



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September 6. The topography was found to have very materially changed during the interval of thirty years, since the original survey.

From here, I proceeded to township 1, range 12, west of the fourth meridian, and completed the retracement of part of the township. Then a survey was made of that part of township 17, range 5, omitted by the original survey. South Saskatchewan river was also traversed throughout the township and twenty-three river-lot monuments destroyed. These old river lot mounds have proved confusing to the settlers and in consequence one homesteader had built his house off his homestead.

A considerable portion of this district appears to be more adapted for ranching than grain growing. Wheat farming has not proved, as yet, very successful, but the settlers engaged in mixed farming are prosperous. Many ranchers are irrigating land to grow alfalfa. A beautiful meadow of 100 acres was noticed in township 1, range 12, on the Milk river flat, the water used being obtained by damming Red Deer creek. This small scheme has proved a success. Along the South Saskatchewan several other schemes were noticed. Here the water is obtained by pumping it from the river to the top of the river flats. Gasoline engines are used to run the pumps, and the high cost of the power so obtained renders the practical success of these schemes somewhat doubtful. However, a rancher, Mr. Lokier, showed me where gas was bubbling up through the water of the South Saskatchewan in township 17, range 4. This proved on test to be largely methane gas, therefore it is probable that the settlers may obtain natural gas here at a moderate depth and then have a cheap fuel for power. Many seams of coal were noticed in the river banks in township 17, range 5. This coal is used for fuel by the neighbouring settlers. The veins are numerous, and some lignite veins are five feet thick, but the coal of best quality occurs in veins about two feet thick. On account of the distance from railways and the lack of local demand, no commercial mining has been done.

On September 25, I began the survey of coal leases in township 19, range 4, west of the fifth meridian. An investigation into the location of some old coal claims surveyed twenty years ago showed that these claims were placed approximately one mile in error upon the map of the old survey. Because of this mistake in the former survey, these claims occupy part of the land that was supposed to be open for leasing.

The work in Alberta was completed by three more small surveys, the traverse of St. Mary river through township 2, range 25, a resurvey to correct one section line in township 2, range 19, and an investigation and necessary surveys of a dry lake shown by the original survey as Horsefly lake in township 9, range 16, all west of the fourth meridian.

On October 18, I began the investigation of Whitebear lake in townships 23, ranges 15 and 16, west of the third meridian. The lake was found to have completely dried up, and the dry bed was surveyed so that the land might be disposed of. Similar surveys were made to deal with Pelican lake, in townships 18 and 19, range 1, which has become dry. These dry lake bottoms are of little value until improved. The old beaches are very stony and the bottoms are grown up with foxtail or wild barley, which is practically useless for hay or pasture.

The following surveys completed the operations in Saskatchewan: A small resurvey upon petition to correct errors in the original survey of township 18, range 8, the survey of Swan lake and retracement of a large part of township 10, range 8, on account of large errors found in the original survey, the investigation of a reported error in the returns of the survey of townships 3 and 4, range 18, the completion of surveys in connection with Katepwe park townships, 19 and 20, range 12, and a small resurvey in township 11, range 6, all west of the second meridian; the traverse of one bank of the South Saskatchewan through townships 25, ranges 5 and 6, a restoration survey upon petition of owners of lands affected in township 25, range 5, and the retracement survey of a small portion of township 23, range 9, all west of the third meridian.



## SESSIONAL PAPER No. 25b

On December 16, operations were begun in Manitoba by an investigation of the survey of township 25, range 9, west of the principal meridian. It was found that considerable worthless swamp land had not been correctly surveyed by the original survey. This district is so wet that it is very difficult to make surveys until late fall or winter. The settlers here are generally from Iceland and appear to be fairly prosperous. They cut hay around the marshes for their stock and grow but little grain. The winter fishing on lake Manitoba is another important source of income to the people of this district.

The following surveys were made to correct errors found by the inspectors in surveys recently made under contract; the resurvey of one section line in township 21, range 11, west of the principal meridian, the survey of a small lake omitted in the original survey of township 10, range 15, and the re-marking of posts and placing of mounds in townships 10, ranges 13 and 16, east of the principal meridian. Investigation showed that the posts reported wrong were correctly marked in townships 11, ranges 13 and 14.

In addition to the miscellaneous surveys, observations were taken whenever opportunity permitted, for magnetic declination, inclination and total force, these observations not materially retarding the regular work. Sixty-three observations for declination were obtained in forty-one different townships with a Bausch and Lomb trough compass attached to the standards of a Watts transit.

The observations for magnetic inclination or dip and total force were made with a Dover dip circle according to Dr. Lloyd's method. Twenty-six stations were occupied, a total of seventy-nine observations for inclination and forty-nine observations for total force being obtained.

Before and after the field operations, the correction to be applied to the readings of magnetic declination of my compass and the "A factor" of the total force readings were obtained personally at the Magnetic Observatory, Agincourt, Ont. As my assistant took many of the observations for dip and total force, he also determined the constants of the dip circle at Agincourt in order to correct for personal equation.

I have the honour to be, Sir,

Your obedient servant,

G. A. BENNETT, D.L.S.



## APPENDIX No. 15.

## ABSTRACT OF THE REPORT OF G. H. BLANCHET, D.L.S.

## SURVEY OF THE 22ND BASE LINE WEST OF THE FOURTH MERIDIAN.

The organization of the party having been completed we left Edmonton on February 12, 1913, for Prince Albert and from there we proceeded via the Canadian Northern railway to Big River settlement.

From Big River to Isle à la Crosse, a distance of 165 miles, the Isle à la Crosse Fish Co. have opened up a good winter trail by which fish are brought out from the northern lakes and merchandise is taken in, to be distributed in summer by water.

Beyond Isle à la Crosse there was no trail and it was reported that hay was scarce and the ice bad. The winter had been very severe in this country, the snow being over two feet deep and a cold north wind blowing almost continually. Under these conditions it was difficult to hire freighters, but finally seven teams were obtained which with my own three were able to handle the outfit. Owing to the difficulty we had breaking trail with the heavy freighting teams, I decided it would be impossible to use bob-sleighs on the line with my light horses, so I disposed of my sleighs and replaced them by flat sleighs.

On March 11, the post at Methye lake was reached and the freighters were sent back. A day was spent outfitting toboggans and pressing hay, and then we proceeded by the dog trail to our starting point at Garson lake, reaching there on the 14th. After establishing the meridian across the lake, the base line was begun on the 15th.

The height of land between the Churchill (Hudson Bay drainage) and the Athabaska occurs about the centre of range 2, being marked by extensive muskegs rather than an elevation. The region included in this watershed has little economic value, the timber being small and the land too wet for agriculture, but it is useful in conserving the water supply.

The muskeg country extends westward to Christina river which crosses the line near the centre of range 4. This river flows in a northeasterly direction, discharging about 1,500 cubic feet per second, and it is broken by many rapids from here to its juncture with Clearwater river. It drains the country lying between the height of land and the "Little Rocky mountains," its basin extending south to township 74. Its immediate valley first becomes appreciable about three miles south of the line and from there it increases rapidly to about six hundred feet in depth at its juncture with the Clearwater. Along the river flats there are some small groves of excellent spruce and upstream there are some good hay sloughs. There are also many areas of good agricultural land along this river and its tributaries.

Farther west the country rises towards the "Little Rocky mountains" from which many fairly large streams flow northeasterly into the Christina. In general the soil on the ridges is rather light, and in the valleys where not too wet it is good. Much of this district has been fire-swept but some areas of good timber remain, notably along Grégoire river.

The "Little Rocky mountains" are roughly triangular in shape, the vertex being about nine miles north of the base line at the west side of range 8, whence lines extending southeast and southwest mark the limits of the elevated area. Proceeding southward they become broader and flatter, the south boundary being a curve with Christina river occupying the valley to the south. The northerly border of the "mountains" is marked by escarpments with rock exposures where they are cut by creek valleys. Extensive lake-like muskegs which give rise to many streams occupy most of the top of the plateau. These streams cut deep valleys through the borders of the plateau which is, consequently, very rough. The drainage is northeasterly into the Christina and thence via the Clearwater into the Athabaska, and north and north-westerly through Hangingstone and Horse rivers into the Athabaska.



## SESSIONAL PAPER No. 25b

In range 10 the line left the high lands of the mountains, dropping to a country which continues almost level to the Athabaska. The drainage here is poor and, consequently, the land is principally muskeg. The only horse feed obtainable was in the beaver meadows along the small streams. The country south of the base line continues the same till the slope of the mountains is reached. Two principal branches of Horse river rise in the mountains to the south and cross the line, one in range 12 and the other in range 14, and after flowing north for a few miles they both turn easterly, flowing in parallel courses and finally uniting in range 10. From there the stream swings off to the north, emptying into the Athabaska. There is considerable good land lying along its course.

After crossing the westerly branch of Horse river the line enters what is known locally as "Twasinaw" muskeg, which is a peculiar lake-like area about ten miles across and almost surrounded by poplar and jackpine ridges. Algar lake is situated near the centre of this muskeg, and lies just south of the line. Two branches of Algar river rise here and, after crossing the line in range 15, unite about two miles north and flow in a northerly direction into the Athabaska, which at this place is about fifteen miles north of the line and flows in an easterly direction. The sleigh road from Horse river to McMurray passes through this muskeg and crossing the line at the westerly side of range 14 practically follows Horse river down to McMurray.

Athabaska river crosses the line about the centre of range 17, and is approached through an extremely wet stretch of muskeg broken by islands and ridges of jackpine. The line passes just north of "Grand" rapids and across "Little Grand" rapids which extend down stream for about two miles. These rapids form the chief obstacle to navigation on this section of the river which here, becoming wide and shallow, flows through a bed of sandstone. An island about a quarter of a mile long divides the river where the greatest fall occurs into two unequal channels. The westerly, though the wider and fairly straight, is unnavigable, being shallow and strewn with large boulders, while the east channel through which the scows are taken is narrow and crooked. "Little Grand" rapids, though rough, are not very dangerous. As far as power development is concerned the situation is somewhat similar to the Lachine rapids on the St. Lawrence and might, perhaps, be similarly treated. "Grand Rapids" settlement, situated on the east bank of the river here, was crossed by the line. The river valley is about 400 feet deep.

Westward from the river the country has been badly burnt, though some areas of timber, protected by muskeg, remain. The country bordering the river is much cut up by deep creek valleys but contains some good agricultural land.

After the abrupt rise out of the Athabaska valley the country ascends gradually to the west for about fifteen miles, and is drained by many small streams rising in the muskegs several miles back from the river. These have deep abrupt valleys where they enter the Athabaska valley, and in consequence the country bordering the river is very rough in places. There are also several fairly large rivers with more extensive drainages, the chief of which are the Loon, Three rivers and the Little Buffalo. Loon river rises about ten miles west of the Athabaska and flows northeasterly into it at the head of the Grand rapids. Most of its valley has been fire-swept but a few bodies of good timber remain. The stream is about twenty-five feet wide at its mouth. About six miles north of the line three fair-sized streams flow northeasterly into the Athabaska, all entering it near the same point. They all rise in lake-like areas of muskeg in the interior. Little Buffalo river rises in a lake of the same name in the northerly part of township 86, range 20, and flows easterly into the Athabaska near where it makes its big bend from a northerly course to an easterly one. In several places at the mouth of this river natural gas escapes through cracks in the earth in sufficient quantities to keep up a brisk flame. With the exception of the strips of dry land bordering the river and its tributary streams as far back as they hold their valleys, the country is principally muskeg.



The rainfall in July was excessive and this, combined with the swampy surface, practically flooded the country, especially the hay meadows, and these conditions finally made it advisable to postpone the completion of the line till after freeze-up. The party was therefore taken out to Edmonton and discharged.

The autumn of 1913 was remarkably fine and mild. The ice on the lakes and rivers did not become safe till December, and the snow was very scanty till the end of that month. After organizing a new party I left Edmonton on December 2 and proceeded to the work by way of Athabaska and Wabiskaw, reaching the latter place on December 8. There was practically no snow there, and Wabiskaw river was reported to be open. It was therefore necessary to open up a sleigh road from the north end of Wabiskaw lake to the line, a distance of about sixty miles by the route we travelled. The line was reached on December 18 and the next day we started working on the line and bringing up the caches. During the interval while we were out, one of the caches was broken into and the contents stolen; this left us very short of supplies for a time.

The height of land between the Athabaska and Wabiskaw rivers was crossed in range 20. This is covered by an extensive tamarack muskeg which drains easterly through the Three rivers and Loon river into the Athabaska and westerly via the Wood Buffalo into Wabiskaw river. The country in the neighbourhood of the "height of land" is practically level and consequently all muskeg. Some interesting features may be observed there. The dry land, lakes and rivers, found ordinarily, are here represented, respectively, by spruce muskeg, lake-like areas of tamarack muskeg and tamarack runs. With an outlet that would give efficient drainage the country would soon rid itself of its excessive moisture, but the problem of draining an extensive level district is a difficult one. In considering the problem of reclaiming the muskegs of the north country the question of muskeg subsoils is an important one, and investigation reveals some interesting conditions. From the amount of sand forming the surface in many parts of the north and from the fact that precipitation is not ordinarily excessive one would expect natural absorption to go on to a much greater degree. This is prevented to a greater extent by an impervious stratum of clay with a thickness varying from a few inches to several feet lying on top of the sand. It is probable that the sand is of recent origin as it lies generally in the depressions, the underlying sand coming to the surface in the ridges. This sand may not have a great depth as is suggested by the fact that it sometimes is of a quicksand nature. The ice which remains most of the year under the moss in muskegs lies on top of the clay. The most important considerations in facilitating drainage are, first the removal of the surface moss to cause the ice to melt more quickly and allow freer flow, and secondly to increase absorption, if possible, by ditches cut through the impervious clay. The usual profile of the northern swamp lands is more that of a shallow plate than of a bowl such as is usually found in Northern Ontario. Wabiskaw river crosses the line in range 23. It has no immediate valley but occupies the bottom of a wide shallow valley which is about fifteen to twenty miles wide. Much of this valley is muskeg but areas of good land occur along Wood Buffalo river flowing northwesterly into the Wabiskaw north of the line and Trout and Bear rivers flowing easterly, south of the line. These three rivers, which are each from a chain to a chain and a half wide, form, with the addition of the Wabiskaw lake drainage, the principal sources of the upper Wabiskaw. There are some stretches of merchantable timber along each. There is also an area in townships 82, ranges 23 and 24, known locally as "the mountain" consisting of ridges and islands on which there is a good growth of poplar and spruce and which contain considerable land of agricultural value.

There are many small rapids along the Wabiskaw but probably none producing water-powers of economic value.

The fifth meridian was reached on January 26, 1914, and on the 28th, the work of closing having been completed, the party left for Edmonton, arriving there on February 7.



SESSIONAL PAPER No. 25b

## APPENDIX No. 16.

## REPORT OF W. J. BOULTON, D.L.S.

SUBDIVISION SURVEYS IN SOUTHERN ALBERTA.

CALGARY, ALBERTA, March 2, 1914.

E. DEVILLE, Esq., LL.D.

Surveyor General,

Ottawa, Canada.

SIR,—I have the honour to submit the following report on my operations in the field during the past season.

Having completed the organization of my party I left High River, Alberta, on May 17, 1913, and two days later arrived at my first work, in township 16, range 3, west of the fifth meridian.

The work in this township lay in the westerly and southerly parts, which are mostly covered with willow brush and poplar. The township is well supplied with splendid water, being traversed in its northerly sections by Pekisko creek, a stream about fifty links in width, and by many other smaller creeks which are well distributed throughout the township.

After completing this work, I did some subdivision in townships 15, ranges 2 and 3, and township 14, range 3, in the order named. Two small lakes were traversed in township 15, range 2.

Townships 16, 15 and 14, range 3, are quite similar in their general characteristics, varying from rolling and hilly to rough and mountainous, the ravines and coulees being mostly covered with willow, poplar, jackpine and a few spruce.

From a rough estimate I should say that only twenty-five per cent of the territory included in these townships can be classified as open, but that part affords an abundance of rich grass. This feature together with the provisions made by nature for water and shelter, makes the country one that is especially adapted for the grazing industry. This industry has been taken up by a few ranchers in this vicinity, and their efforts have been very successful. The soil is generally very good, ranging from sandy to black loam, but on account of the short growing season and the ever present frosts, it is not suitable for agricultural pursuits. Plenty of fish, partridges and prairie-chickens are found in these parts. Access to these townships is rendered very easy by excellent trails leading from both High River and Nanton.

On September 4, I started south to do some subdivision work in townships 8, ranges 2, 3, 4 and 5, as I wished to finish the mountainous work before October 15, which date, generally marks the advent of the stormy season in the foot-hills of southern Alberta. In going to this work, we followed a well-beaten wagon trail practically straight south, in range 2, until we arrived in township 10, where we crossed the north fork of Oldman river, turned west for about four miles and thence south on a splendid trail to township 8, range 2, where we stopped and completed the subdivision in this township. This being done, we continued on this trail which joined the Crowsnest trail, about one and one-half miles east of Burmis, a small town on the Crowsnest division of the Canadian Pacific railway. This latter trail is macadamized right through the Crowsnest pass, and is used by automobiles.

The work in township 8, range 5, was first completed, after which that in township 8, range 4, was begun. This latter work practically followed the top of Bluff



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mountain, and although it was very rough, and at times very treacherous, some excellent closings were effected, having of course to resort to triangulation in many instances. Bluff mountain is practically covered with spruce varying from six inches to two feet in diameter, but on account of the precipitous nature of the country lumbering there would be quite difficult.

Having completed this work, we moved to a small abandoned village called "Lille" from which point we did the work in township 8, range 3. The main part of this work consisted in running north on the meridian, which forms the eastern boundary of sections 5, 8, 17, 20, etc. To run the actual meridian itself was impracticable. So after running one mile north I started triangulating and traversing. I succeeded in again getting back on the line about one and one-half miles south of the northeast corner of section 32 and from there I ran due north to the northeast corner of section 29, where I deviated my bearing to hit the post at the northeast corner of section 32, finally effecting a closing of two inches in departure at this point. This township is practically all limestone ridges, with deep valleys and ravines. The valleys contain burnt timber only, which is at present used for mine props. Coal mining was an important industry at one time in this township, but has of late years been abandoned.

There are many good indications of coal in townships 8, ranges 4 and 5, and many small seams were noticed, but it has all been taken up and will eventually be worked by the companies operating in these parts.

On October 25, we left Lille for township 4, range 1, west of the fifth meridian. We left the Crownsnest road at Burmis and travelled in a southeasterly direction along a splendid wagon road, to Mountain Mill, thence south to section 7, township 5, range 1. From this point several trails provide a means of access to township 4, range 1. The country through which we passed on our way is well settled and is practically all under cultivation, and judging from improvements and the general prosperous appearance of the farms, the yield is very good.

I encountered four settlers in township 4, range 1, and ascertained from them that hay is the only thing that can be grown successfully there, the short season and intense early frost preventing any extensive agricultural operations. Ranching is engaged in to a slight extent. The westerly and southerly parts are practically all limestone ridges, with intervening valleys of green and dry spruce timber, varying from four to twelve inches in diameter, while the remaining part is rolling to hilly, mostly covered with willow brush and poplar, thus rendering the grazing possibilities only fair.

After completing the subdivision in this township, which consisted of that part lying immediately outside the forest reserve, we went to township 3, range 30, west of the fourth meridian, and completed similar surveys there. The general characteristics of this township are similar to those of the one previously mentioned. Streams of considerable size, varying from thirty to forty links in width, would provide an adequate supply of water for ranching purposes. Township 3, range 30, is very well occupied by settlers, but there are practically no improvements.

Game such as partridges, prairie-chickens, bears, mountain goats, and mountain sheep is more plentiful in this district than in any other through which I passed during the season.

The work in township 3, range 30, west of the fourth meridian, having been completed, I started north again to township 10, range 3, west of the fifth meridian. This township, which is located near the "gap" in the Livingstone range of mountains, was reached by following an excellent wagon trail to Pincher creek, thence to Cowley, and from there to our destination where we arrived on November 22.

My work in this township consisted in running south from the correction line for five miles along the boundary of the Dominion Forest reserve, and connecting up the corners on the chords to the east, all of which I completed by December 1. The meridian followed a very deep valley, which was covered by spruce, jackpine, willow



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brush and poplar. There are a few settlers in this township, but they have made no noticeable advancement or improvements. It is an exceedingly rough country, and there are several good indications of steam coal in the northerly part,

Deer are quite numerous in this locality, many hunters being attracted there during the open season.

The months of October and November were very stormy, and we were frequently compelled to cease work on account of the high winds, which I understand are quite prevalent in the foot-hills at this time of year.

I next completed the survey of the boundary of the Dominion Forest reserve, in township 11, range 2, and also that part in the southwest corner of township 12, range 1.

Having completed this work, I again returned to the locality in which I had been working during the summer months and finished the survey of the boundary of the forest reserve in townships 13 and 14, range 3, after which I moved to township 14, range 2, and completed the subdivision of that township.

During the season we succeeded in running 211 miles, of line, including traverse and trial lines.

On January 12, 1914, I again arrived at High River, where I stored my outfit and made suitable arrangements for the wintering of my horses. This having been done, I, with one assistant, went to Coleman, Alberta, and completed a small survey there, returning to High River on January 17.

I have the honour to be, Sir,

Your obedient servant,

W. J. BOULTON, D.L.S.



## APPENDIX No. 17.

## ABSTRACT OF THE REPORT OF E. P. BOWMAN, D.L.S.

## STADIA SURVEYS IN WESTERN SASKATCHEWAN.

The work on which I was engaged during the season of 1913 was an examination of the lakes and other bodies of water in the district lying south of Battleford.

I arrived in Battleford on May 17, and spent several days there in organizing my party and purchasing horses, wagons and the outfit required for the work. The party left Battleford on May 23, reaching our first work in township 40, range 19, west of the third meridian, on the 24th.

The lakes and other bodies of water in sixty-two townships were examined during the season; those which were considered permanent were traversed, and others were investigated as to their depth, locality, nature of the water, and any other points worthy of note. Camps were located at suitable points for reaching the work, usually one camp being located in each township, unless time could be saved by doing two or more townships from one camp.

Magnetic observations were taken whenever possible without hindering the regular work to any extent. Astronomical observations were also taken as often as possible when the weather was favourable. In all sixty-one magnetic and forty-two astronomical observations were obtained during the season.

In accordance with instructions the condition of the monuments in each of the townships was noted, and as much territory covered in each as was possible without loss of time on the regular work, thus serving the double purpose of seeing as many monuments as we could, and of locating bodies of water not shown on the township plans.

I closed my operations in the field on December 10 and returned to Battleford, where I discharged my men and made arrangements for wintering the horses and storing the outfit.

Most of the bodies of water examined in the prairie country have no springs or other permanent sources of supply. The quantity of water in them is variable, depending on the annual rainfall and snowfall. Many are shallow, and contain water in the spring but dry up during the summer, excepting in wet seasons. In some districts particularly in fairly level, open country, the lakes seem to have permanently dried up. In one district four such townships were observed in each of which at least one lake and several marshes existed at the time of the original survey about ten years ago, but at the time of our survey not a drop of water was found in any of them, the land being suitable for agriculture. One of these lakes which covered an area of two thousand acres or more at the time of the original survey, was found entirely dry, and part of it was producing grain crops. In other districts, where the land is more rolling, the change is not so marked, but many of the lakes now produce slough and marsh grass and large portions of the old beds have become suitable for hay or pasture land. An occasional deep lake was found, however, which will be permanent for a number of years, and in some districts springs exist which feed the lakes and tend to keep them at a more constant level. A number of alkaline lakes were also found. Very little change occurred in the limits of vegetation around such lakes even where practically dry owing to the alkaline soil. These alkaline flats require to be dry for several years before vegetation begins and then the first growth is usually foxtail and other weeds.

The settlers claim there is more water in the lakes this year and last year than there has been for the preceding three or four years. This is probably due to the wet season



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of 1912, which filled the lakes and sloughs to a greater depth than usual, and saturated the soil to a higher level so that percolation does not proceed as rapidly as it did during the preceding dry years.

The condition of settlement varies in different parts of the country. In general, however, practically all of the Government lands are taken up by settlers, except in those sections where the land is unsuitable for farming, owing to its stony or hilly nature. In some districts, the country is very well settled, almost all of the land being under cultivation, while in other parts farther removed from the railways the settlement is in its initial stages. In the better settled townships good roads are being constructed along the road allowances, and the settlers have good buildings and prosperous looking farms.

The difficulty of obtaining water in some districts is a serious drawback to the settlers. Many of them have to haul water for their stock and general use for several miles. In one instance a settler was hauling it from a spring seven miles from his home. The cost of drilling wells is usually too great for the early settler as in many cases it is necessary to drill from two hundred to three hundred feet to obtain water.

The farmers in this district are engaged chiefly in grain growing although many of them have recently been devoting more attention to stock raising and mixed farming. This seems to be advisable owing to the uncertainty of the crops on account of frosts or hail and also because of the gradual exhaustion of the soil caused by continuous grain production. Mixed farming is carried on in those districts more remote from the railways where the cost of hauling grain to the elevators becomes a serious item of expense and in hilly and wet districts where the land is hard to till.



## APPENDIX No. 18.

## REPORT OF M. P. BRIDGLAND, D.L.S.

## TOPOGRAPHICAL SURVEY OF THE CROWSNEST FOREST RESERVE.

CALGARY, ALBERTA, February 23, 1914.

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa, Canada.

SIR,—I have the honour to submit the following general report on the operations of my party during the season of 1913, while engaged on the topographical survey of the northern part of the Crowsnest Forest reserve.

On June 2, the party started for Claresholm, from which point it had been decided to enter the northern part of the reserve. From there camp equipment and supplies were freighted in to a point near "The Gap", which is a narrow pass about forty miles southwesterly from Claresholm, where Oldman river flows through the Livingstone range. While this was being done, the horses were driven down from Okotoks to "The Gap."

Later it was learned that a better way of reaching "Thé Gap" was by way of a wagon road from Lundbreck or Cowley, on the Crowsnest branch of the Canadian Pacific railway. This route is shorter and is not nearly so hilly as the other.

Owing to the necessity of testing camera levels, and of determining the focal length of cameras and the speed of the photographic plates, some delay followed our arrival at the Gap. Consequently it was not until June 13 that actual survey work was started. During this time, however, the bulk of the camp equipment and supplies was moved by pack train farther into the mountains, so that no more delay would be caused by difficulties of transportation. A temporary cache was made at the ranch of Mr. R. MacDonald, about a mile west of the Gap.

From June 15 to August 6 work was carried on from this point. Trips were made up Oldman river, Dutch creek, and Livingstone river and its tributaries. It was then decided to move south towards the railway, surveying the other valleys on the way. The valleys of Racehorse, Vicary, and Daisy creeks were covered, thus completing the drainage basin of Oldman river. While the railway and the adjacent land is not included in the reserve, the boundaries are so irregular that it was decided to partially cover all the country rather than to adhere strictly to the reserve. Another reason for this decision was that as the elevations of all stations were to be based on a traverse of the railway, it was necessary to occupy stations adjacent to it in order to carry the elevations to the more distant peaks. Seven stations south of the railway were occupied in order that they might be connected with the traverse and used as a basis for elevations of future stations in the southern part of the reserve.

While no organized system of triangulation was carried out, angles were read to connect different stations as well as possible. Advantage was taken of any old signals that could be located. Stations adjacent to the railway were fixed by a traverse of the railway, and a sufficient number of the more remote stations were connected with the posts of the Dominion lands system to control the survey.

The season of 1913 was, on the whole, favourable for the work. The party left Calgary on June 2 and returned on September 25. During this time 114 triangulation stations (exclusive of section corners or secondary camera stations) were occupied and twenty-two miles of railway traversed. Only eighteen days were completely lost owing to bad weather, though work was frequently interrupted on other occasions. No delay was caused by smoke and no prolonged delay by bad weather. On account of the low elevation, the hills were seldom covered with clouds, although the higher peaks to the west were often clouded. Work on the summits was frequently interrupted by local



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thunderstorms, but these rarely lasted more than a couple of hours. The worst difficulty was due to incessant high winds, which rendered good work extremely difficult. In the absence of sharply defined topographical features, on sunny days the distance was often rendered indistinct by haze, particularly in the direction of the sun.

The northern part of the Crowsnest forest reserve covers an area of about 650 to 700 square miles and lies chiefly in townships 9 to 14 inclusive, ranges 3, 4, and 5, west of the fifth meridian. Nearly all of this area is drained by Oldman river. The chief tributaries of this river, which are Livingstone river, Racehorse and Dutch creeks, join the main stream before it flows through the Gap. This part of the reserve consists principally of rolling hills, the higher summits rising slightly above timber line. On the west side, running in a northerly and southerly direction, there is a limestone range forming the summit of the Rocky mountains and the boundary between British Columbia and Alberta. The peaks of this range vary from 8,500 to 10,000 feet in elevation. Adjacent to this range there is a series of lower hills where the highest summits run from 7,000 to 8,000 feet above sea-level. About fifteen miles east of the main range and running almost parallel to it, lies the Livingstone range, also a limestone formation. This range is slightly higher than the intervening hills, especially south of the Gap. Farther east the hills rapidly become lower.

The country as a whole is comparatively open. There are good trails which are practically free from steep grades, bad swamps, or muskegs, in all the main valleys. In many cases horses can easily be taken through country where no trail exists. In most sections feed is very plentiful, the valleys as a rule being "U" shaped, with large meadows in the bottoms. In addition many of the hillsides are open and are covered with a luxuriant growth of grass and pea-vine. During the past summer the upper part of Livingstone valley was used as a range for several hundred cattle. Wild flowers of many varieties are abundant, particularly on some of the upper slopes near the timberline. Edible fruits are scarce, soapberries (if these can be called edible) and wild black currants being the only varieties seen in any quantity.

Timber of commercial value is not plentiful. A bad fire a few years ago burned over much of the country and did a great deal of damage to the standing timber. There is some spruce near the heads of Oldman and Livingstone rivers, but the greater portion of these basins has been burned over and is either bare or is covered with a growth of small jackpine. In the southwest part of the reserve near the heads of Dutch, Racehorse and Vicary creeks, and along the valley of Allison creek, there is a considerable quantity of spruce about eighteen inches in diameter. East of Livingstone range the country is more open and there is no timber of commercial value. The varieties of trees usually seen are spruce, small poplar and jackpine in the valleys, scattered fir, spruce and jackpine on the hillsides, and spruce, balsam and pine on the upper slopes.

So far as could be learned no minerals other than coal have been discovered. Much of the country is held under lease for coal rights, and stakes were frequently seen. In only one place, however, were surface outcrops seen by any member of the party.

Trout abound in Oldman river and its tributaries, but are not as plentiful as in former years. During the fishing season of 1913 the Gap and its vicinity was visited by many fishing parties, and there is no doubt that as the attractions of this locality become better known the number of parties will increase and the number of trout will correspondingly decrease. At the present time there are very few fish in Crowsnest river or its tributaries at the southern end of the reserve. Large game does not seem to be very plentiful. Deer were seen on several occasions, and some mountain goats were encountered on the main range. There are a few bears, but berries and wild fruit are too scarce to offer them much inducement to remain in the country permanently.

I have the honour to be, Sir,

Your obedient servant,

M. P. BRIDGLAND, D.L.S.



## APPENDIX No. 19.

## REPORT OF J. A. CALDER, D.L.S.

## SUBDIVISION SURVEYS AROUND KAMLOOPS.

ASHCROFT, B.C., January 15, 1914.

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa.

SIR,—I have the honour to submit the following general report on my surveys in the railway belt, British Columbia during the season of 1913.

I left Kamloops, where my party was organized, on May 9, 1913, and commenced the season's work in township 17, range 25, west of the sixth meridian. There I surveyed suitable grazing lands along Twaal creek, and retraced a part of Cooks Ferry Indian reserve No. 6. This portion of the township is very hilly and broken, and nearly all the land surveyed is suitable only for grazing. There is fair bunch-grass on all the lower slopes. Some benches along the east boundary of the township are cultivated, and the quality of the soil is generally excellent, but the scarcity of water for irrigation discourages more extensive farming.

I next subdivided certain sections along Pimainus creek in township 17, range 24, consisting for the greater part of a narrow valley, which save for some stony bench land in sections 21, 22 and 15, contains no land which could be tilled profitably. There is good grazing along the creek but the sides of the valley might be too steep in places for stock.

Most of this township consists of an elevated plateau, well timbered with fir and jackpine, and is nearly all covered with a good growth of timber grass, or pine grass as it is sometimes called. Unfortunately cattle and horses do not thrive on it, and it is generally considered worthless for grazing. I have been credibly informed, however, that sheep do well on this grass and if this be so, large tracts of the central plateau of British Columbia, which hitherto have been considered worthless, may in future provide a very valuable addition to the food supply of the province.

Deposits of gypsum have been discovered in various places along Pimainus creek. Since this mineral is of small value in proportion to its weight, the expense of transportation is likely to prohibit the development of these claims for a long time.

There are several fair-sized lakes at the head of Pimainus creek in township 17, range 23, which are well stocked with good trout.

On June 10, I moved to Drynoch and began work in township 16, range 25. The right bank of Thompson river was traversed from the north boundary of Cooks Ferry Indian reserve No. 2 to the south boundary of the township; such lines as were necessary to complete the survey of the sections adjoining the river were run and several Indian reserves retraced and tied in. The portion of this township which lies west of the Thompson is very rough and broken, so that it was difficult to run some of the lines.

I also subdivided nearly the whole of the east half of this township, which lies mostly on a rolling and hilly plateau between the Thompson and Nicola valleys. This plateau is generally well timbered with fir and bull pine, interspersed with some open patches; it is nearly all fair to good grazing land, and considerable areas in places, are arable. The elevation averages from 3,400 to 4,000 feet above sea-level, and nothing more delicate than hardy cereals and vegetables can be grown. The Indians on Nicomen Indian reserve No. 10 raise most of the ordinary vegetables successfully, as well as



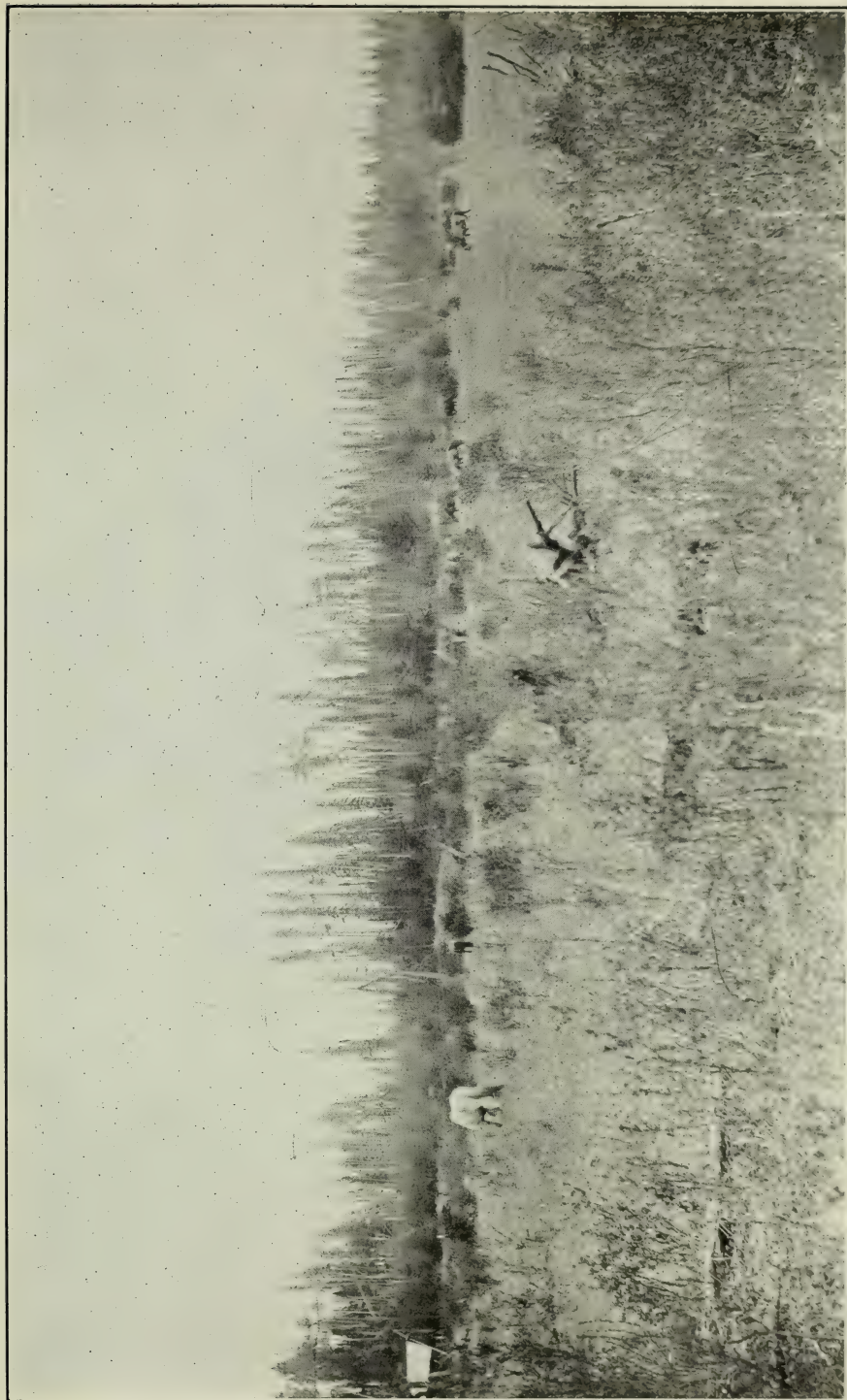


Photo by G. H. Blanchet, D.L.S.

**Beaver Meadow on Twenty-second Base Line West of Fourth Meridian.**

These beaver meadows are formed by deposits of silt carried down by the river and stopped by the beaver dams. Extensive flats of very rich land were thus formed and, as there are no trees, the snow melts very early in spring. Horse feed can thus be obtained on these flats long before the snow disappears in the woods, where the evergreens prevent the heat of the sun from reaching the snow.







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grain, but the latter sometimes does not ripen before the fall frosts set in. There are a number of good springs throughout the township, and while the amount of water is not sufficient to be useful for irrigation, they constitute a most valuable asset for a stock range. Strawberries grow in great profusion, ripening about the first of July. Bands of wild horses range over this plateau, furnishing considerable diversion for the Indians, who often endeavour to capture some of them with but indifferent success. Even when captured young, it is almost impossible to break them. Blue and willow grouse also abound in this district.

Subdivision was extended southerly to include grazing lands in the northeast quarter of township 15, range 25, and such portions of Indian reserves as fell within the lands surveyed were retraced and tied in. Both banks of the Thompson were traversed through this township, and the survey of the sections along the river was completed where necessary.

Miscellaneous surveys along the Fraser, from Lytton to the north limit of the railway belt, occupied practically the remainder of the season. The country there is very mountainous and broken, especially on the west side of the river.

In townships 17, ranges 27 and 28, a number of small benches occur in the sections surveyed on the lower slopes of the mountains. Many of these have been cleared and are cultivated by Indians. These Indians seem to be, as a rule, good farmers. Practically all the suitable land within their reserves is utilized, and they have gone to considerable pains constructing ditches and flumes for irrigation purposes. There is no wagon road along the west side of the river, and any farm produce they may raise has to be brought to market, or at least part of the way, on packhorses. For this reason beans are the principal crop grown, as their value is great in proportion to their bulk, and they stand rough handling well. Until a road is built along this side of the river extensive development cannot take place.

I subdivided such lands along McGillivray creek, in township 18, range 27, as I considered valuable. The best land is a sloping bench in the east half of section 8 and the grazing is generally good throughout this section.

In township 18, range 28, I completed the survey of section 15 including the establishment of half a mile of the north limit of the railway belt, and the traverse of the right bank of Fraser river through this section. Some subdivision was also made on the east side of the river, including some patches of good land, suitable for settlement, in sections 26, 23 and 14.

This portion of the Fraser valley is very suitable for general farming. There are many thriving orchards, and dairying is carried on very successfully by a few ranchers. Bees do well, and give good returns with apparently little attention. The climate is excellent, and there are no summer frosts. This district being in the "dry belt", irrigation is essential, and generally the amount of water available is not sufficient to supply all the cultivable land. In many places this condition of affairs could be improved by constructing reservoirs at suitable places along the streams, wherever dams could be built economically, and thus conserve much of the water which now is lost in the spring.

Considerable prospecting is being done along McGillivray creek, and some fair samples of platinum and gold have been found, but not in paying quantities. Many of the bars along the Fraser are occasionally worked on a small scale for gold by Indians, who generally make fair wages. Several benches of what must have been fine agricultural land, close to the river, have been washed for gold in years gone by, and there is now left only a waste of rounded small boulders and stones. It is doubtful if the amount of gold thus obtained compensates in the long run for such wanton destruction of one of the province's most valuable assets.

After completing a few small surveys near the town of Lytton, I decided to discontinue field operations for the season: the remaining lands to be surveyed were at a considerable elevation and the snow was deep.



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I arrived at Kamloops on December 15, where I discharged the party on the following day.

Although an unusual quantity of rain fell during the summer months, the season generally was very favourable for surveying and the fall was ideal from a surveyor's point of view.

I have the honour to be, Sir,

Your obedient servant,

JOHN A. CALDER, D.L.S.



## APPENDIX No. 20.

## ABSTRACT OF THE REPORT OF A. V. CHASE, D.L.S.

## SURVEYS IN THE RAILWAY BELT, B.C., SOUTH OF LYTTON.

I organized my party at Kamloops, and on May 22, 1913, we left for township 14, range 27, west of the sixth meridian where our first surveys were to be made.

The valley of Fraser river in this township is narrow and flanked by steep mountains to the east and west, and averages scarcely more than one mile in width. In this valley may be found land suitable for settlement. Small areas of bench land at varying elevations are found throughout the valley and are composed almost without exception of a good quality of light sandy loam soil. Some areas include also a considerable quantity of sandy gravel. The timber in this township is not of merchantable value. It is composed throughout of bull pine and fir up to twenty-four inches in diameter, the quality being generally better to the west of the river. Much of it in accessible places has been cut by settlers but it still covers most of the main valley except in the vicinity of lands which have been cleared and improved. The average size would scarcely be considered of any value for lumbering.

Our next work was in township 13, range 27, and in townships 12 and 13, range 26. The valley of the Fraser through these townships conforms to the general character of the valley in this locality except in the southern part of township 12 where the mountains to the east recede to a greater distance from the river, leaving areas of bench and bottom land as far as two or two and one-half miles from the river. Bench land fit for cultivation was found adjoining the river in the southern part of township 13 and throughout township 12. Considerable settlement has taken place in this neighbourhood and other settlers are waiting for the vacant lands to be sufficiently surveyed for disposal to make homestead entries thereon.

I then decided to move into the valley of Nahatlatch river in townships 12, ranges 26, 27, and 28, and do as much work there as could be accomplished before the uncertain fall weather set in. To this end I moved by wagon to the cable ferry of Messrs. Wordenhoff & Co. at Keefers, B.C., where my outfit was transported across the Fraser. From the ferry I moved to the end of the wagon road by team and wagon, but was disappointed by the non-arrival of packhorses for which I had arranged but which had strayed into the hills. I was able, however, to move sufficient of the outfit into the valley by man pack to supply us with food and shelter for the night, and the next day, August 23, the remainder of the outfit was moved down to the valley by pack horses, and camp was set up in the southeast quarter of section 13, township 12, range 27.

The valley of Nahatlatch river and lakes is essentially, as far as these surveys were carried, a narrow defile between steep mountain ranges to the south and north, but small areas of workable bench land are found along the valley. These when close to the river bottom are inclined to be very sandy and somewhat stony, but such benches as are at a slightly higher elevation are composed of a very good quality of sandy loam and light sandy loam soil. Most of this class of land is found in range 27, the mountains in ranges 26 and 28 rising as a rule from points close to the water's edge. In township 12, range 26, in this valley, are to be found several areas of excellent bench land at from 500 to 600 feet above the river, but this land is nearly all disposed of. Only one bona fide settler was found in this valley west of range 26.



5 GEORGE V., A. 1915

The timber in the Nahatlatch valley is scarcely of sufficient value to warrant lumbering operations. In the river bottom bull pine, white pine, fir and cedar are found in fair size and quantity, but as the elevation increases white pine and cedar disappear and the timber is composed mainly of scrub, bull pine and fir, with jackpine in the higher altitudes.

This valley can be reached by wagon road from Keefers to the divide between Fraser and Nahatlatch rivers and thence by a good pack trail to Hannah lake, in section 19, township 12, range 27. From this point the pack trail is not fit for loaded horses and supplies must be carried westward on the lakes by means of rafts or dug-outs. At the western end of the lakes the pack trail is again fit for use by loaded horses, and access may be had by it to the western limit of the railway belt.

The physical features of the land surrounding the western part of Nahatlatch lake suggest the advisability of a micrometer traverse, and as I did not have the necessary instruments with me, I left this work to be carried out at a later date.

On October 30, I returned to the Fraser valley to complete before the end of the season certain surveys for which there was an immediate necessity in township 12, range 26, and in township 13, range 27, and on November 28 I moved camp to Lytton to complete some work omitted earlier in the season in township 14, range 27.

This ended my work for the season. I disbanded my party on December 6 and left at once for Orillia, Ont., where I arrived on the 11th.



## APPENDIX No. 21.

## ABSTRACT OF THE REPORT OF G. W. COLTHIAM, D.L.S.

## STADIA SURVEYS IN CENTRAL ALBERTA.

On May 26, 1913, we left Edmonton, where I had organized my party, and proceeded easterly over the Canadian Northern railway to Sickman lake, in township 52, range 13, west of the fourth meridian.

Surveys of lakes in the following townships were completed during the season:—

Townships 50 and 52, range 9, townships 49, 50, 51, and 52, ranges 10 and 11, townships 47, 48, 49, 50, 51, and 52, range 12, and townships 47, 48, 51 and 52, range 13, all west of the fourth meridian. An inspection was made of township 50, range 13, but no bodies of water of sufficient importance to warrant a survey were found. No lakes exist in township 51, range 9, or township 49, range 13.

Sickman lake is surrounded by hills which rise gradually from the shore. About a mile from the southerly end of the lake they attain a height exceeding 100 feet. Small fresh-water springs are found along the shore, and these serve to partially offset the effects of evaporation of the lake water. The lake level, however, has fallen in recent years as the old shore is visible in many places more than a chain from the water's edge. The shore is composed of sand and gravel and rises very slightly for some distance. The water is slightly alkaline, and the greatest depth found was about fifteen feet but soundings indicate that the bed is uneven. The bays are very shallow.

The soil in this township is a sandy loam, and while not very suitable for the cultivation of cereals is well adapted to the production of potatoes and garden vegetables. The greater part furnishes splendid grazing land for cattle and horses. Small scattered areas of poplar, a few acres in extent, furnish fuel to the surrounding settlers.

Township 52, range 12, contains a great many lakes; those in the northerly part are all surrounded with poplar of small dimensions while the shores are obstructed with dry fallen timber. In several small lakes ranging from nine to twelve feet in depth portions of dry trees were standing, indicating that they are of comparatively recent origin.

The surrounding country is rolling, broken by small hills, and not well adapted to cultivation, but furnishes good summer pasture for cattle.

A small lake formerly existing in the southwest quarter of section 7 has entirely dried up, and the old lake bed is covered with grass. The only apparent cause of its disappearance is evaporation, as no surface outlet or inlet is visible. A lake lying in sections 2 and 11 contains upwards of thirty islands, and has only narrow channels of open water. These islands lying a few feet above the water are thickly timbered with small poplar. The lake water though almost free from alkali is stagnant, and is filled with small green particles of vegetable matter which in the presence of the sun's heat impart a putrid odour to the water, and give it a most unpleasant taste. The depth is fairly uniform averaging about ten feet. The shore line is timbered, and low hills rise from the water's edge. The surrounding country is settled largely by Russians and Galicians, who have as yet tilled only a few acres of their farms, the land in fact being too rough and broken for profitable cultivation but well suited for cattle ranching. The soil in general is a light sandy loam.

The lakes in townships 52, ranges 11, 10 and 9 contain water which is almost free from alkali and which, after boiling is quite potable. A lake in sections 19 and 20, range 11, has a hard level bed of sand and gravel and open shores and contains fine clear



5 GEORGE V.. A. 1915

drinking water of temporary hardness. The other lakes are surrounded by small scrubby poplar and have nearly level shores. Many of these lakes are fed by springs which seem to maintain a fairly constant level.

The surrounding country is rolling, and near Vermilion river the hills are rather precipitous. The soil consists of sand and clay loam on which grain thrives but cultivation is difficult. The land is perhaps quite as valuable for grazing purposes. Poplar timber which occurs in scattered areas ranges from two to seven inches in diameter.

Vermilion river drains a large area but in the month of July it was only twenty to thirty feet wide and three feet deep, with a sluggish current. The river valley ranges from ten to twenty chains in width, with abrupt banks rising from fifty to one hundred feet in height. Small scattered spruce and poplar fringe the summit of the bank.

The lakes in townships 51, range 10, and the easterly part of range 11, were found to have dried up considerably, the open prairie country and shallowness of the water promoting active evaporation. The shores are sandy and quite level while the water contains in solution a high percentage of alkaline salts. The depths range from one to four feet and under present conditions these lakes will disappear in a few years.

The country is quite level and well adapted for grain growing although only a very small fraction of the available land is under cultivation. The settlers in this district follow mixed farming and raise a large number of cattle and horses.

In the westerly part of townships 51, range 11, and the northerly part of range 12, the lakes are different in character, having greater depths and being surrounded by rough hilly country, covered to a large extent with small poplar and scrub. A depth of forty feet was found in a lake lying in sections 26 and 35, range 12. This was the greatest depth noted in any lake during the season's work. Dry timber standing in several feet of water near the shore of this lake indicated that the water had risen quite recently. The shore is rough, and covered with dead timber. The water is rather stagnant and slightly alkaline. The small lakes in sections 10, 11, 14 and 15, range 12, contain less than two feet of water and must under present conditions eventually disappear. Incrustations of alkaline salts are found along the shores. The lakes in sections 21, 28, 29 and 33 of this township are quite picturesquely situated and contain clear sparkling water which however is alkaline to the taste.

A lake lying in sections 31 and 32, township 51, range 12, and partly in township 52 was completely dry in the month of June, but contained several inches of water two months later, after the summer rains had fallen. No survey was made as it was thought that it will soon be permanently dry.

The township is similar in its general topography to the one adjoining it to the north. The small town of Ranfurly on the line of the Canadian Northern railway from Edmonton to Vermilion is situated in the southeast quarter of section 15. It has one grain elevator, two stores, and a hotel and a population of about one hundred.

Township 51, range 13, is rolling in character, the land being light and arid, and consequently grain farming is not pursued. It would appear however to be suitable for sheep ranching.

Birch lake extending into townships 50 and 51, ranges 11 and 12, was the largest than two feet of water and must under present conditions, eventually disappear. Incrustation of water surveyed during the season. This lake with a maximum width of nine miles in an easterly and westerly direction, presents so many long inlets connected with the main body by narrow channels, that the amount of shore line is very great compared with the water area. The west shore in range 12 is sandy and the land rises gradually from it. A fringe of poplar extends to within a few chains of the water's edge. The shore line here indicates that the water has fallen three to four feet within the past few years. Several small bays originally connected with the large westerly bay of the lake are now isolated from the main body forming separate shallow lakes with level sandy shores. The land adjoining the shore is rolling, but not too rough for cultivation,



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though it might prove more profitable if used for grazing as the soil is sandy. The farmers in this section have experienced some difficulty in obtaining a sufficient supply of good water. The southerly shore of the lake is similar in its general characteristics to the westerly shore. The land adjoining the inlets of the lake is low and wet during the greater part of the year. In range 11 the land is rolling and in parts too rough for profitable tillage, but furnishes good pasture.

Masses of limestone were found strewn along the north shore in several places, but it is evidently too easily disintegrated by weathering agencies to prove valuable as a building material. A steep precipitous clay bank ranging from fifty to one hundred feet in height extends several miles along the north shore. The small adjoining lakes have evidently been connected originally with the main body. The greatest depth noted was thirty-five feet; this was found at a point a few chains south of the larger island in the large easterly bay extending northward.

A large ranch containing about 6,000 acres comprises the area along the north shore between the two great bays. The greater part of this land is rough and hilly with long narrow coulees affording fine natural shelter for stock in winter. At present about 1,000 acres are under cultivation. Springs of clear hard water are found along the lake shore in section 34, range 11. The lake water is soft containing a high percentage of solids in solution and although alkaline is not unsuitable for stock. Owing to the presence of free ammonia in the water it has been found that fish will not thrive. According to the testimony of the surrounding farmers several of the islands in the lake have appeared only within the last ten years, showing that the lake level has fallen three or four feet at least in that time. The town of Innisfree situated on the Canadian Northern railway in section 2, township 51, range 11, has a population of about four hundred and owing to the proximity of the lake attracts quite a number of summer campers from Edmonton and neighbouring centres.

Townships 50, ranges 10 and 11, consist of open rolling and undulating prairie. The soil is chiefly clay loam and is exceptionally well suited to the production of wheat and oats. All the land open for entry is being farmed, with large areas already under crop.

Townships 49, ranges 10 and 11, contain very rolling land, with good clay soil in several sections; but it is too rough for extensive cultivation. Good farm land is found in the south part of range 11, where the surface is undulating with several quite level sections. Alice lake in this township is evidently slowly drying up; evaporation is very active, leaving the water in the lake extremely alkaline, so that it is even unsuitable for stock. The adjoining small lakes are very shallow and will probably soon disappear. In range 9 the surface is very rolling in character.

Townships 47 and 48, ranges 12 and 13, contain some of the best wheat producing land in Alberta. The surface is level or in places sufficiently undulating to afford good natural drainage. The soil is clay and clay loam which seems especially suitable for the production of wheat and oats, the common crops in this locality. The settlers here are principally Norwegians who have adopted modern, and even scientific farming methods with surprising rapidity and remarkable success.

The town of Viking, situated on the main line of the Grand Trunk Pacific railway, in the northeast quarter of section 36, township 47, range 13, has a population of about four hundred, and is a thriving agricultural centre with three grain elevators, which during the month of November were receiving grain at the rate of 5,000 bushels per day.

Thomas lake, the largest in this district, presents some peculiar features. The depth is variable, while springs of water of a higher temperature than that in the lake rise in various places from the lake bed, which is very soft and composed of alkaline clay and mud. The lake level however appears to be gradually lowering.

The lake in section 10, township 47, range 13, was found to have entirely dried up. Evaporation and cultivation of the surrounding soil appear to be active agencies in



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drying up most of the shallow lakes that came under our observation, while the element of rainfall seems to exert comparatively little effect on the level of many of these lakes. Various large sloughs which according to the testimony of settlers existed four or five years ago have entirely disappeared. In most instances this has proved of great benefit to the farmers as the land now produces heavy crops of good hay.

The lakes on the northerly part of township 52 and the northeasterly part of township 51, range 12, seem to have maintained their present level for a long period, and in a few cases appearances seem to indicate that new lake bodies have been formed comparatively recently.

Game was plentiful throughout the whole area where surveys were performed. Ducks of various species were plentiful on nearly all the lakes and sloughs while flocks of geese frequented the larger bodies of open water. Several flocks of pelican were seen, as well as various kinds of snipe and small aquatic birds which frequented the shallow lakes with open shores. Prairie-chickens were everywhere abundant while a few ruffed grouse were noticed in the timbered areas. Rabbits were very numerous particularly in township 52, range 12. Jumping deer, though not plentiful, are to be found in township 52, range 12, and the vicinity of Birch lake, but no moose are to be found in this region. For feathered game this district is considered to be one of the best hunting grounds in the province.

The weather, during the months of June and July was rather damp, although the actual rainfall was not heavy; but the warmer weather in August and September together with the absence of early frosts which often occur in the district, combined to make the season one of the most favourable that the farmers have experienced for over ten years. It was noticed that in the low flat sections frosts occurred earlier and were much more severe than in the higher and more hilly parts.

The weather conditions however are such as to permit of the raising of practically all the common kinds of vegetables and small fruits, where proper methods of preparation and culture of the soil are pursued.

On November 24, owing to unfavourable weather conditions, operations were suspended.



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## APPENDIX No. 22.

## REPORT OF G. C. COWPER, D.L.S.

STADIA SURVEYS IN SOUTHERN SASKATCHEWAN AND ALBERTA.

OTTAWA, February 27, 1914.

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa, Canada.

SIR,—I have the honour to submit the following report on the stadia survey of lakes carried on by my party in southern Alberta and Saskatchewan during the past season.

I left Welland on May 5, 1913 and proceeded to Medicine Hat, where I organized my party. On the 20th of the month I left for township 9, range 8, west of the fourth meridian, the scene of my first operations. My work consisted of the traverse by stadia of all lakes of a permanent character over five acres in area and the investigation of all lakes and marshes which had dried up since the original surveys or which were likely to dry up. These surveys were carried on in sixty-three townships in Alberta, extending from townships 1 to 22 and ranges 1 to 14, west of the fourth meridian.

From township 9, range 8, I worked east to township 8, range 2. The country passed through is well settled and few homesteads remain to be taken up. Townships 8, ranges 2, 3, and 5, are rougher than the others and are largely under lease for cattle and horse grazing. The remaining townships are homesteaded, the settlers going in for mixed farming.

The only body of water of any importance in these townships is Elkwater lake, in township 8, range 3. This lake is two miles long by a mile and a half wide and is composed of three arms. The deepest sounding taken was twenty-one feet. The water is cool, clear and well stocked with pike. It is prettily situated at the foot of a high wooded hill and part of the south shore is laid out as a summer resort. The lake is only thirty-five miles from Medicine Hat, and as there is a good trail to that city, a large number of people from there use it as a summer resort.

From Elkwater lake I moved south by way of Medicine Lodge coulee to township 1, range 2. This coulee runs north and south and varies from one to two miles in width, with banks from 100 to 400 feet high. The coulee and the land immediately east is well settled as far south as township 5, but from there to township 1 the country is rougher and is practically all under grazing lease, and the ranch houses are widely separated.

Township 1, range 2, is well settled by Americans, who on account of the great distance to the nearest railway in Canada do most of their trading in Montana. This will largely be overcome on the completion of the Weyburn-Lethbridge branch of the Canadian Pacific railway.

Milk River lake in this township is about three miles long and varies in width from ten chains to half a mile. It is very shallow, and at the time of my survey, June 23, contained only a little over a foot of muddy water. In a dry season it will completely dry up, but it will not produce hay.

From this township westerly to Comrey, in township 2, range 6, the country is rough and is sparsely settled with ranchers. From there northerly to Pakowki lake, in townships 3, ranges 7, 8, and 9, townships 4, ranges 7 and 8, and townships 5, ranges 7, 8, and 9, the country is well settled with homesteaders. This lake was originally



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a large body of water. The main body of the lake was ten miles long and from two to six miles wide; it had two long arms, the one at the southwest end being seven miles long and three-quarters of a mile wide, and the other at the northwest end being four miles long and about half a mile wide. It has dried up considerably in the last few years and is very shallow, three feet being the greatest depth found. The land formerly in the lake and now dry is gumbo soil and is covered with foxtail. The water is milky and unfit for use. There are a number of creeks flowing into the lake but there is no outlet.

The country around the lake, with the exception of the north end, where there is a large sheep ranch, is well settled. A large number of Americans, who came into this district in 1910, are following mixed farming, and although at present fifty miles from the railway they are meeting with success. The new branch of the Canadian Pacific railway from Weyburn to Lethbridge runs just north of the lake.

From Pakowki lake I moved to Crow Indian lake, in townships 5, ranges 13 and 14, passing through a well settled country. This lake is about four and a half miles long and 20 chains wide. It is situated in a long coulee about a mile wide with banks about 200 feet high. The greatest depth found in this lake was six feet, and the water is fresh and good. The area covered by water is fairly constant except at the west end where the lake runs out into a long marshy flat. The overflow from this lake reaches Pakowki lake.

From Crow Indian lake I moved north to the town of Grassy lake, in township 10, range 13. For the first ten miles after leaving Crow Indian lake there are practically no settlers, but from there north to South Saskatchewan river the country is well settled. In townships 9, ranges 11, 12, 13, and 14, and townships 10, ranges 11, 12, and 13, only one lake was found to contain water, all the other lakes having dried up. These now form valuable hay meadows.

The next townships investigated were those situated between the main line of the Canadian Pacific railway and Red Deer river and from South Saskatchewan river west to range 12. The largest lake shown on the map for this district is Tide lake which originally covered half of township 18, range 10. This lake was found to be completely dry and its bottom which is gumbo soil was covered with more or less vegetation. I investigated seventeen townships in this district in which all the lakes were dry, and in ten others some of the lakes were dry and some were found to still contain water the year round. The only lake in this district of which special mention may be made is Old Channel lake in townships 14 and 15, range 5. This lake is in the form of a horseshoe and is about two miles from end to end and ten to twenty chains wide. It was evidently at one time the channel of the South Saskatchewan, but the river has cut a new channel. The lake is very shallow, varying from one to two feet deep, but it has never been known to be completely dry.

In townships 20, ranges 4, 7 and 8, township 19, range 3, and townships 17 and 18, range 5, a number of alkaline lakes were traversed. These lakes contained very little water, but their bottoms are composed of very soft white alkaline mud which, even when the water disappears, do not become dry, nor do they produce any vegetation. In some cases the settlers have these lakes fenced off to prevent their stock from becoming mired in them.

This district is becoming very well settled. New houses were noticed going up in all the townships, and new land is being broken. The branch of the Canadian Pacific railway from Swift Current to Bassano runs through this district. Some of the townships are rough and broken and are under lease for horse and cattle ranching. There are no sheep ranches in the district.

The next area investigated was in townships 12 to 17, ranges 1 to 3 inclusive. In these townships about half of the lakes were found to be dry while the remainder still contain some water. These townships, with the exception of townships 14, ranges 2 and



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3, which are rough and hilly, are well settled, mostly by Germans. There are no large or important lakes. A number of summer camps for sheep were seen.

On September 19 I finished the survey of the lakes in township 12, range 1, thus completing my surveys in Alberta.

My surveys in Saskatchewan were confined to the block of townships composed of townships 12 to 16, ranges 20 to 26, west of the third meridian, in which I surveyed and investigated all the lakes. These townships are situated immediately north and east of Maple Creek settlement and the townships are with a few exceptions well settled.

The settlers in this district go in for mixed farming and very few of them depend altogether on the growing of grain. There are still a number of ranches in this block. Township 12, range 23, and township 13, range 20, are both entirely under grazing lease. Township 14, range 24, and townships 16, ranges 23 and 24, are largely composed of sand hills. At one time there was some fairly large timber in these townships, but the settlers have cut practically all of this and now very little except scrub remains. The ranchers in this district raise horses, cattle and sheep.

Crane lake, in townships 13, ranges 22, 23 and 24, is the largest body of water in this district. It is about eight miles long and five miles wide at the widest part. On account of a thin coating of ice I was unable to sound it, but it is said to be twenty feet deep. The water in the lake is slightly alkaline but it is used for stock. The lake is fed by Bear creek and has no outlet. Crane lake has dried up somewhat in the last few years. This is most noticeable on the south side where the land is low and flat.

Bigstick lake, in townships 15, ranges 24 and 25, is also a large body of water, but it is drying up rapidly although it has no outlet. This is accounted for by the fact that the water in Maple creek, which is the lake's only source of supply, is being used for irrigation purposes. The water is also slightly alkaline and the greatest depth found was nine feet. The east end of this lake is very shallow and the land rises very gradually. As the water recedes it leaves good hay lands. In both Crane and Bigstick lakes moderate quantities of pike and sucker are to be found, and both of these lakes are frequented in the fall by a large number of ducks, geese and cranes.

In township 16, range 25, a very unique lake was found. This lake is about two miles long by half a mile wide, and at the time of my survey, October 8, was dry except for a few inches of water at the north end. The bottom of the lake is covered with a coating of hard crystalline and alkaline salt varying from a few inches to a foot in depth. At the south end of the lake there is a large mound of alkaline salt of snowy whiteness, about fifteen feet in diameter and eight feet high, and close to it there is a smaller mound about three feet high. The mounds are composed of clear crystalline salts which on exposure to the air break down to a white powder, and this powder covers the mounds to a depth of an inch. I cut about a foot into the larger mound without finding any change in its composition, but on cutting six inches into the smaller one, water spouted out and continued flowing. On returning next day this mound was found to be again sealed up. These mounds are apparently formed by salt springs, which on coming to the surface deposit the salt. The mounds are said to disappear and to be built up again, and one settler informed me that he had seen five of these mounds at one time. It appears that when the lake fills up in the spring with the fresh snow water and the heavy rains, these mounds are dissolved and the salt is then deposited over the lake bottom.

Vincent lake in townships 14 and 15 range 22, which is approximately the same size as the last mentioned lake has practically the same bed formation, but there are no mounds in it. A number of smaller lakes were examined which had the same hard crystalline salt bottom, but in none of these were any springs noticed.

In sections 30 and 31, township 15, range 20, there is a fairly large lake with a hard crystalline bottom. About twenty chains south there is a much smaller lake without any water but with a very soft white alkaline mud bottom, and about fifteen



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chains east of this there is a fresh-water lake. The lake with the hard crystalline bottom is in a small valley, while the other two are in another valley but they are not connected.

In these townships a large number of lakes were surveyed which were practically free of water but the bottoms were soft white alkaline mud. These lakes carry water so long each season that their beds never become really dry, and vegetation has no chance to grow. In a few cases where the lakes have remained dry, vegetation appeared to be starting.

The deepest lake encountered during the season was Freefight lake, in townships 16 and 17, range 23. It is about two miles long by half a mile wide, and is surrounded by high rolling prairie. It is fed by a fresh-water creek but the lake itself is strongly alkaline. It was found to be over sixty feet deep.

Practically all the lakes surveyed during the season were found to cover a smaller area than they did at the time of the original surveys, from ten to thirty years ago. This may be partly accounted for by the fact that the land is becoming more broken each year, thus allowing the surface water to sink in. Virgin prairie is almost impervious to water.

A large number of the prairie lakes have no well-defined inlets or outlets. They are simply pot-holes, varying from a few acres to a few square miles in area. The surface water from the melting snows and the spring rains fill them and evaporation is their only outlet. As the land becomes more valuable and proper drainage is instituted many of these lakes will be reclaimed for hay meadows and in some cases for the growing of grain.

The one great drawback of this southern country to the homesteader is the uncertainty of the rainfall for the ripening of his crops, and to the rancher the uncertainty of having an abundant supply of fresh water for his stock.

The game consists of ducks, geese and cranes in large numbers, and an occasional antelope in the less settled districts.

As to the accuracy of the stadia for traverse surveys, I would mention that I closed a large number of my traverses by latitudes and departures and found the closing errors in many cases to be little in excess of that which would be expected with a transit and chain. In one case I retraced three miles of a base line with the stadia and differed by only seven links from the theoretic at the end of that distance.

During the season I completed the survey and investigation of the lakes in ninety-two townships and partly investigated eleven other townships.

I completed operations in the field on December 20 and reached my home in Welland on the 24th.

I have the honour to be, Sir,

Your obedient servant,

G. C. COWPER, D.L.S.



## APPENDIX No. 23.

## ABSTRACT OF THE REPORT OF A. L. CUMMING, D.L.S.

## RESURVEYS IN SASKATCHEWAN AND ALBERTA.

My work during the season of 1913 consisted of resurveys, retracement and restoration surveys of townships, the original surveys of which were performed twenty or thirty years ago.

I organized at Edmonton and shipped my outfit to Strome, Alta., on July 7, 1913. My first work was to renew the monuments adjoining Wavy lake in townships 44 and 45, range 15, west of the fourth meridian. Upon completion of this work I drove by way of Content and Red Deer to Cygnet lake which lies in township 38, range 28. This lake was reported to have been greatly lowered by a ditch which had been constructed by the railway company whose grade crosses this lake. The ditch has lowered the water in the lake by about two feet but has not caused any great change in the shore line, except that in a dry season some valuable hay sloughs would be available. I inspected the monuments surrounding the lakes and replaced a number of iron posts that were missing.

My next work was on the correction line between townships 26 and 27, range 15, where I corrected the positions of the monuments. I shipped most of my outfit to Munson by Canadian Pacific and Canadian Northern railways and drove across country lightly loaded. I passed through a flourishing well-settled farming country. Mixed farming is increasing in every district; this method of farming practically guarantees the farmer a fair year, even if his grain suffers some from an early frost. Due to the poor service over the new road from Stettler to Munson I was able to complete my work before my freight arrived.

I reloaded my outfit at Munson and shipped it to Maidstone, Saskatchewan, where I made a retracement and restoration survey of township 45, range 23, west of the third meridian. The surface of this township is hilly, the northeastern portion being rough. Approximately two-thirds of it is settled, and mixed farming is being carried on extensively. The soil is a good loam from four to eight inches deep with a clay subsoil. There are numerous lakes in this township, one of which is salty, but the majority have potable water. Every settler has a good well. I found the majority of the old markings, but due to the hilly nature of the country they were hard to locate without re-running the lines. I found the original work very good, but practically all the posts had to be renewed.

From this work I moved north into township 48, range 22, where I retraced the southerly two-thirds of the township and traversed the lakes. The surface is gently rolling and covered with willow and poplar bush. There are a number of lakes in the township partly surrounded with good hay sloughs. The water in the larger lakes is fresh. The soil is a light brown loam from two to six inches deep with a sandy subsoil and mixed farming is largely carried on. Every settler has a good well, water being available at a depth of twenty to forty feet. A large amount of breaking and fencing has been done and considerable land is under crop.

On the completion of this work I shipped the outfit to Sprucegrove, west of Edmonton, and drove to my next work which was a small correction survey in townships 50 and 51, range 27, west of the fourth meridian. I then returned to Edmonton and dismissed my party on October 5, 1913.



From this date until I closed operations on February 9, 1914, I was employed on miscellaneous surveys and the traversing of lakes. The first lakes to be traversed were in townships 51, 52 and 53, range 2, west of the fifth meridian. The work progressed somewhat slowly at first due to the scarcity of help and the lack of ice on the lakes, but as soon as the ice would carry us we made good progress. We also had a few days' work in township 55, range 2.

My next work was to survey the townsite of Nordegg at the Brazeau coal mines in township 40, range 15. I lost considerable time in reaching the work due to the unreliable transportation facilities but the railway has reached the mines and regular mixed trains are running now. This country is being rapidly opened up. A number of settlers are locating south and southeast of the Rocky Mountain House district, and a few have homesteaded west of this point along the right of way. The Brazeau Mines company are counting on spending large sums of money in developing their properties and building a model town to be known as Nordegg. The company employs at present approximately one hundred and fifty men and will greatly increase this number as soon as they start to ship their coal. In December, there were thirty-four thousand tons of coal on the dumps ready for shipping. The company has selected an ideal townsite surrounded by magnificent mountain scenery.

Upon my return from the Brazeau coal fields I left by way of Athabaska for Heart lake, situated northeast of lac LaBiche, in township 69, range 10, west of the fourth meridian. There is a great rush for homesteads in lac LaBiche district due to the construction of the Alberta Great Waterways railway to McMurray. A great deal of this country is very suitable for cattle raising and mixed farming. A great number of settlers have already got their title for their farms, but development has been retarded due to the long distance from a railway or a market. A fine class of mixed farming country extends from lac LaBiche, in townships 67 and 68, ranges 13 and 14, south to within twenty miles of the Canadian Northern railway. My next work was in the Cold lake district. There one sees a large number of up-to-date houses and farms. The only drawback is the great haul to a railway or a market. Every settler I met expressed the greatest confidence in the country. The farmers are for the most part going in for mixed farming. This winter has been exceptionally fine and warm, so that farmers were able to keep their stock out for most of the winter. In some localities they did not commence to feed hay until the end of January.



## APPENDIX No. 24.

## ABSTRACT OF THE REPORT OF W. J. DEANS, D.L.S.

MISCELLANEOUS SURVEYS AND INSPECTION OF SURVEY CONTRACTS IN MANITOBA AND  
EASTERN SASKATCHEWAN.

On June 2, 1913, I left Winnipeg with my party for Point du Bois via Lac du Bonnet, arriving at the latter place the same evening. I was delayed there two days on account of a breakdown on the tram line running to Point du Bois, so that I did not arrive at my work until the 5th.

The city of Winnipeg has a hydro-electric power plant located at Point du Bois falls on Winnipeg river, and has applied for certain lands above the falls for flooding purposes.

It has been agreed between the engineers of the city of Winnipeg and the department that an elevation of 212 feet above Winnipeg city datum would be required.

In order to deal with the application of the city it was necessary to measure the area in each quarter-section which would be flooded by the dam. To determine these areas the 212-foot contour had to be located on the side of the river and on the islands in the river.

This work was started by the late William Ogilvie, D.L.S., but owing to his death it was not completed.

My first camp was located about four miles above the power station on the south side of the river, and from this point I was enabled to traverse some ten miles of the contour. There are a number of bench marks along the river from which I obtained the height of the water. I then set a water gauge and noted any change in the level; from the water level I obtained the position of the contour.

The land surrounding that portion of the flooded area which I surveyed is mostly rocky, with patches of soil in places, and is covered with a thick growth of jackpine, balsam, hemlock and poplar, varying in diameter from two to ten inches. In many places the windfall was high and the underbrush thick, and as we had to cut lines through this, our progress on some days was very discouraging. The land is of no use for farming purposes, and as the timber is too small and too scattered for lumbering, it could be utilized only for fuel. The waters of Winnipeg river teem with fish and the forests abound with large and small game. There is a saw-mill located at Point du Bois which affords employment to a considerable number of men. The logs are obtained from a point down the river and are brought to the mill in booms. The lumber is shipped to outside points, first over the tram lines owned by the city of Winnipeg to Lac du Bonnet and thence by the Canadian Pacific railway.

The Hydro-electric power plant at Point du Bois is quite extensive, and has been instrumental in reducing the cost of electric lighting to the citizens of Winnipeg and furnishing them with cheap power for manufacturing purposes. Notwithstanding this, it pays at the present time, and, when fully developed will be a money-making proposition for the city of Winnipeg, and will make the city a great industrial centre.

On July 26 I finished the traverse of the 212-foot contour, and on the 28th moved my outfit down to the tram lines, loaded it on and, with my party, went to Lac du Bonnet. The next day I started for Tisdale by way of Winnipeg, stopping on the way at Portage la Prairie to pick up my horses and wagons which had been left near this place. After loading the horses and outfit I proceeded to Tisdale, arriving there on July 31. I was delayed there until August 5 awaiting the arrival of my outfit by freight.



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On the following day I started for township 48, range 10, west of the second meridian, and got as far as Arborfield, where I was delayed by heavy rains. On the 9th I received a telegram instructing me to re-inspect contract No. 7, of 1911. As the telegram stated that it was imperative that this work should be done at once, I immediately returned to Tisdale and loaded my outfit on the train for Bannock, arriving at that place on the 19th. From Bannock I recut an old pack trail to section 33, township 45, range 9, west of the second meridian, and moved part of my outfit there. The land in that vicinity is well adapted for mixed farming. The soil is a black loam, with clay subsoil, and is covered with small poplar, willow and some scattered tamarack. There are numerous open patches of high land, an abundance of hay in the meadows, and good water in the numerous small lakes. The Prince Albert branch of the Canadian Northern railway runs through township 45, affording good transportation facilities. At Bannock and Mistatim stations saw-mills are located which would provide a market for any produce raised in the locality and which furnish employment for the settlers when not engaged on the land.

On September 16, I moved the outfit by train from Bannock water tank to Tisdale, on my way to township 48, range 10, and on the 18th reached Burntout creek, where I was compelled to stay for nearly a week on account of heavy rains which rendered travelling over the trail almost impossible. On September 27 I started for township 48, and after a hard day's travel through mud up to the axle, we arrived late at night within a few miles of where I intended to start work. The next day I moved to section 7, township 48, range 10, and on the following day started to subdivide the northerly two-thirds of this township, which I completed on October 23. There are quite a number of settlers in this township, attracted there by the numerous inducements offered in the way of good soil, plenty of hay for cattle raising, and sufficient timber for building purposes and fuel. Small game is very plentiful and also large game such as moose, elk and bears. Small fruits, such as raspberries, currants and cranberries grow in profusion. The greatest drawback to the settler is the lack of good trails or road. At the present time travelling out for provisions and supplies is attended with a good deal of hardship and inconvenience.

On October 25 I arrived at Tisdale, and on the 27th shipped my outfit to Regina on my way to Buttress. It was necessary for me to wait in Regina until the car arrived, so that I could get it transferred to the Canadian Pacific railway and billed to destination.

I arrived at Buttress with party and outfit on November 1.

My work in that locality was to make a restoration and retracement survey, which I finished on November 8, and on the 11th moved to Johnston lake, in township 14, range 29, where I was to make a correction survey. The land in this township is nearly all settled, but as yet the amount cultivated is very small. I did not see any graded roads in the township, but the trails are good. The nearest and most available railway station is Caron, on the Canadian Pacific railway.

On November 17 I loaded my horses and outfit on a car at Buttress and shipped them to Boissevain by way of Brandon. The outfit and party arrived at Boissevain on November 19, and I at once started for Max lake, situated in township 1, range 20, west of the principal meridian.

My work in this township was to lay out a number of lots along the northerly shore of Max lake in the Turtle Mountain Forest reserve. This lake is situated in the heart of the mountains at an elevation of about 2,400 feet above sea-level, and is two miles long and about the same in width. The shores are mostly sandy or gravelly. In some places the water is shallow, while in other places it is quite deep, so that bathers can choose the water which is deep and cold or that which is warm and shallow. The waters of the lake abound with jackfish, muskallonge, trout and black bass, which are of a very superior quality and flavour. This lake is fast becoming





Photo by J. S. Galletly, D.L.S.

#### Hudson Bay Store and Factor's Residence at Fort Vermilion.

The building in the foreground is the Factor's residence, while away in the background can be seen the flour mill. The store is about half-way between the residence and the mill.

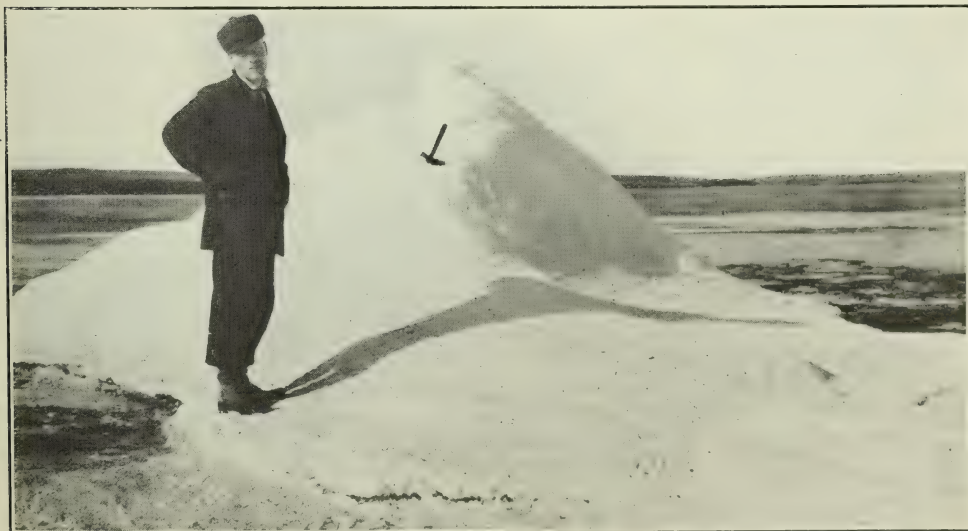


Photo by G. C. Cowper, D.L.S.

#### Alkaline Mound in Southern Saskatchewan.

This mound, on the shore of a lake in township 16, range 25, west of the Third meridian, is about eight feet high and fifteen feet in diameter. It is snowy white and is composed of clear crystalline salts which on exposure to the air break up into a fine white powder which covers the mound to a depth of about one inch. The mound appears to be formed from salt springs. When the lake fills up the mound dissolves, the salt spreading over the bottom of the lake, and when the lake dries up the mound forms again.







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a well-patronized summer resort, and, when better known, will undoubtedly become one of the most popular resorts in Manitoba. The lake may be easily reached from Boissevain by automobile or carriage, being sixteen miles distant from that place. I laid out twenty-nine lots, a small parcel for a picnic ground, and a road. These lots are leased at a yearly rental, subject to a building regulation. I completed the work there on November 29, and on December 1 I loaded my outfit and horses on the train and shipped the same to Fishtown siding, arriving there on the 3rd.

My work was to inspect contract No. 23 of 1913. I recut ten miles of trail, moved to the contract on December 6, and finished the inspection of the same on the 12th. We were in that locality during the big game hunting season, but the hunters did not get as far east as we were, preferring to remain within easy distance of the railway track. The moose were very plentiful, and a good many were shot.

There is some good agricultural land in spots throughout this contract. Township 41, range 25, west of the principal meridian, is mostly level, with ridges of poplar and occasional clumps of tamarack and spruce large enough for lumber. The soil is a black loam, with clay subsoil, and there are many meadows which would produce hay for a large number of cattle. The water is good throughout the township.

Township 41, range 24, is much the same as the last described township, with the exception that the hay marshes are more extensive.

Townships 39 and 40, range 24, contain some good agricultural lands, but are better adapted for cattle raising, as there are many extensive hay marshes throughout these townships. Swan lake occupies a portion of the northeast part of township 40, Birch river, Wood river, and Swan river all flow north and east through this township and empty into Swan lake. These streams all have good banks at a sufficient height above the water to afford a means of drainage for the low lands and swamps.

On December 16, I took the train at Fishtown siding for Swan river, where I paid the party off, and after storing the outfit and making a contract for wintering the horses, I started for Brandon, arriving there on December 22.

The season throughout was favourable for field operations. We had a long spell of warm weather which lasted on into December.

On January 5, 1914, I received your telegram asking me to go to Moosejaw, and settle up the survey affairs of the late Mr. C. E. Johnston, D.L.S. I started that evening, and on the 6th was at work on the accounts. I paid off the men, and made a contract for wintering the horses and storing the outfit. Mr. A. D. Stewart, assistant, took all papers and books to Ottawa.

I arrived back in Brandon on January 14.



## APPENDIX No. 25.

## ABSTRACT OF THE REPORT OF S. L. EVANS, D.L.S.

## SURVEYS IN SOUTHERN ALBERTA.

After outfitting at High River I left on May 23, 1913, for township 17, range 3, west of the fifth meridian where my first survey was located.

Work in this township was started on May 26 and was completed by June 7. The surface of the township is open hilly prairie and is rather too rough for agricultural purposes, although in the northern part there are a few quarter-sections that might be worked. The soil consists of a black loam with clay subsoil. Ranching is already carried on in a profitable manner and seems to be the most suitable occupation for the district, not only owing to the roughness of the township, but also to the high altitude. Summer frosts are usual in this district.

My next work was the completion of the subdivision of the parts of townships 16, 17, 18, 19 and 20, range 4, west of the fifth meridian which lie outside the Rocky Mountains Forest reserve. Townships 16 and 17 which were completed by July 24 are very rough and hilly and are covered for the most part with burnt poplar and spruce. A fire in 1910 completely burned over this district leaving very little green timber. These townships lie very close to the Highwood range of the Rocky mountains and farming, especially grain growing, is not feasible. The hills and valleys are covered with a good growth of grass and afford splendid opportunities for ranching which, at the present time, is carried on very successfully; horses and cattle can range the year round. Highwood river crosses township 17. This stream has a very swift current and no doubt in the future, when the district is settled, will offer opportunities for the development of water-power.

Townships 18, 19 and 20, range 4, were next subdivided. This work was completed by the end of September. Ranching is carried on successfully in these townships, but the country is too rough and hilly and at too high an altitude for grain growing. This district has been the centre of an oil rush during the past season. Oil has been found in the "Black Diamond" well at "Black Diamond" in township 20, range 2. From the opinion of geologists it would appear that the strata in which the oil at "Black Diamond" has been found dips upwards and runs in a northwesterly direction. That would put these townships close to the oil deposits. Prospectors have been busily engaged all summer looking for likely locations in this district.

While engaged in the subdivision of township 19, range 4, I moved camp to township 19, range 7, and ran the north half of the east boundary of section 14. A good pack trail runs up the south fork of Sheep river to Burns' coal claims in this township. A railroad is now being located into this district and it is expected that the coal mines will be opened in the near future.

After the completion of townships 19 and 20, range 4, I moved camp to township 23, range 5, and completed the subdivision of the township. Much of the land in this township is swamp, but the settlers along Bragg creek are ranching successfully. No grain has yet been ripened in the district, as summer frosts are frequent, due no doubt to the closeness of the mountains and the high altitude. This work was finished on October 21, after which I took the party to High River where the men were paid off on the 27th.



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From October 27 I was engaged on miscellaneous surveys. A proposed summer resort on Madge lake in township 30, range 30, west of the principal meridian, was surveyed and a topographical survey of the area made. This was finished on November 26.

My next work was a topographical survey of a proposed summer resort in township 19, range 19, west of the principal meridian. This was completed on December 12.

I next proceeded to township 26, range 30, west of the principal meridian where a traverse of Assiniboine river was made across this township. This was finished on December 31 and after storing the outfit I left for home arriving there on January 8, 1914.



## APPENDIX No. 26.

## ABSTRACT OF THE REPORT OF J. A. FLETCHER, D.L.S.

## BLOCK OUTLINE SURVEYS IN THE PEACE RIVER VALLEY.

My work during the past season consisted of the survey of the west boundary of range 17, west of the fifth meridian from the twenty-third to the twenty-eighth base lines.

I left Edmonton where my party was organized, on March 3, 1913, and proceeded by way of the winter trail across Lesser Slave lake and through Grouard to Peace River Crossing. From Peace River Crossing we followed Peace river down to Cadotte river. This stream was passable for sleighs as far as the junction of the north and south branches, a distance of about four miles from its mouth. The packhorses were used as much as possible to freight in the outfit, but they were too light for teaming and I considered it advisable not to overtax their strength in view of the expected shortage of feed in April and May. The services of three freighters were therefore secured to supplement the work of the packhorses. One team weighing about 2,700 lbs. was taken from Edmonton through to Cadotte river and their weight was very effective in breaking trail on Peace river. Another team was hired from Athabaska to Grouard. The third took a load of supplies from Peace River Crossing to Cadotte river. From there on, considerable difficulty was experienced in securing sufficient feed for the horses, so they were spared as much as possible. Deep snow rendered foraging difficult and frozen grass at best has little nourishment. The outfit was packed up the north bank of Cadotte river and freighted across country on sleighs to the vicinity of our work. Owing to the deep snow and the extensive windfall and timber in this district trail cutting entailed considerable labour, and freighting was tedious and laborious.

Work was commenced on the line on April 8 and, shortly afterwards the snow disappeared, several warm days from the 10th-13th, leaving only a few patches of snow in the shaded localities. The remainder of the month was fine, and the horses were able to get the dry feed with very little difficulty. Sufficient oats were taken along to last, with careful distribution, till the first grass began to appear, toward the end of May, but before it became plentiful in June, the horses failed considerably and not until well on in July, after a month's feed on the splendid meadows northeast of Carcajou, did they regain what they lost during the spring work. However, the convenience with which we got in as far as Cadotte river and the early commencement of the survey in April well repaid the trouble experienced with the horses in April and May. The work proceeded without interruption till September 26, when the survey was completed.

The fall of 1912 had been quite dry and forest fires had started in several localities. West of Peace River Crossing these fires did considerable damage, burning up large quantities of hay. This caused a scarcity of hay in the succeeding winter and spring around Peace River Crossing, prices rising as high as \$50 and \$60 a ton. What was used was brought largely from Grouard where the price was \$25 a ton. When the snow disappeared in the spring the water went off very quickly, surface water bothering very little. The dry weather which followed caused the fires, which had smouldered in some patches of moss in several localities throughout the winter, to break out afresh in the latter half of May and the first half of June. They were burning in several directions. One of our coaches was barely saved, but in saving it two horses were cut off by the fire and subsequent search did not locate them. Trouble was experienced with



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smoke and also with fires about June 5, but shortly after this, between the 10th and 20th, and at intervals thereafter rain fell very opportunely and checked them. At Fort Vermilion the crops and the gardens received the rain to mature before the frosts in the fall.

The extensive rains which fell between Peace River Crossing, Grouard and Wabiskaw in 1913 were not experienced farther north, where the rainfall was sufficient but not excessive. The growth of all vegetation was very rapid in June and July. The month of August was very pleasant. Light frosts were experienced for three nights, the 15th, 16th and 17th, but they were not heavy enough to damage the wheat at Fort Vermilion; after that date the temperature was steadily above freezing point for most of September, which was a rather wet month. The rains though not heavy, fell often enough to interfere materially with the curing and stacking of hay.

The Hudson's Bay Co. arranged to take the party out, promising to leave Vermilion on October 1 for Peace River Crossing, but owing to indifference on the part of some of the officials, their steamer, the *Peace River*, was unable to pick up the party until the 12th, causing an unnecessary and tedious delay of ten days. The trip was made from the twenty-seventh base, up to Peace River Crossing in six days. The two boats plying on Peace river, are both stern wheelers and burn cordwood. The steamer *Grenfell*, operated by the Peace River Trading and Land Co., was running from Fort Vermilion to Fort St. John on a twenty-one day schedule but was incapacitated in the fall owing to an accident to the boilers.

The party crossed the portage to Grouard, two teams being hired, each taking about 1,000 pounds. This trail was in a very bad condition. Owing to the wet summer experienced here, the trail in places was flooded a great part of the summer. In some places it is clay and is graded to a rather flat crown no special attention has been paid to drainage. The road bed thus becomes soaked with rain and once started, soft holes quickly work bigger. The road has been partially corduroyed, but after the heavy traffic of the last few years this corduroy is largely worn out and worn out corduroy is worse than none. In the fall of 1913, this trail for some considerable distances, was well nigh impassable, being a succession of broken patches of corduroy and bog holes. Numerous settlers came to grief, attempting to go in with their effects and supplies. The trail in the winter is very good, sufficient snow falling and enough traffic passing over it, to keep it well broken for the entire distance. March is an excellent month for travel on this trail.

The Northern Transportation company's boat was used across Lesser Slave lake, the boat going down Lesser Slave river as far as Soto landing. Teams were taken across the portage to Mirror landing, a distance of sixteen miles. Several hard frosts occurred in the latter part of October and on reaching Mirror landing, the Athabaska was found to be running full of drift ice. A gasoline boat operated by Mr. Patterson was used in Athabaska. The water was quite shallow and the presence of so much running ice in the river rendered navigation difficult. However, the boat was solidly made and bumped over the rocks without serious injury. It was driven by side paddle wheels and these wheels lost most of the paddles on the trip down, one wheel being entirely destroyed and only half the paddles being left on the other. The party reached Edmonton on November 3 and was paid off.

Townships 89, 90 and 91 in the vicinity of our line are drained to the southwest and west, largely by Cadotte river which flows into Peace river. Nearing the Peace, its current is swift, and as the bed is full of stones, it forms almost a continuous rapid. The valley itself is from a mile to two miles wide and the banks are quite steep. Little Cadotte river which empties into the Cadotte is about a chain wide and in the upper stretches the current is somewhat sluggish, meandering considerably in a more or less direct valley. Numerous beaver workings, some hay meadows, and some good spruce characterize this valley. Fire has passed through this country in recent years and large areas are covered with windfall. Throughout this region, spruce and poplar up to eighteen inches in diameter, alternate with smaller spruce and tamarack in the



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swamps and muskegs. Probably forty per cent of this district is muskeg, but as Peace river is approached the muskegs become less numerous and extensive. Some hay is to be found along the creeks, especially around the old beaver dams. The height of land between the drainage basin of Cadotte river and Cache creek to the north is passed in townships 91 and 92. Several lakes and some sloughs were passed there and creeks thread the most of the country. After draining and clearing, this district would be suitable for agriculture.

Townships 92, 93 and 94 are somewhat freer from muskeg, although stretches of swamp are to be found. The drainage in these townships is largely to the north and parallel to Peace river. The basin of Cache creek is good loam. In townships 95, 96, 97 and 98 between Cache creek and Peace river a large area of light soil with ridges of jackpine and brulé, interspersed with sloughs is to be found, but it is generally too light for good agricultural land. East of Cache creek in the same townships some very good land was seen, and also some rich land bordering Wolverine river. In townships 100 and 101, there is some good merchantable spruce up to thirty inches in diameter near Wolverine and Buffalo rivers. In range 16, there is some open land with rich vegetation and a few meadows. Townships 102, 103 and 104 are quite lightly wooded, and could be easily settled. Hay meadows are numerous and extensive.

The survey line passed about six miles from the Buffalo Head hills, where the country is rough and broken. After crossing Peace river in township 105, an area of light soil, jackpine ridges and interlying swampy meadows with numerous sloughs and lakes extends northward for seventeen or eighteen miles. This area extends in a north-easterly and southwesterly direction being bordered roughly by the trail from Keg river to Fort Vermilion. This trail is a wagon road as far as range 18 and west of there it is a good pack trail. The branches of Boyer river have numerous beaver dams. In August there was practically no current in either of the branches northwest of the Keg river trail. The country drained by these branches is good agricultural and grazing land. Hay meadows are numerous and the country is practically free of muskeg.

During the season, several moose and bears, both brown and black, were seen. Foxes and wolves were observed several times in the vicinity of the twenty-seventh base and beaver and muskrat workings were seen in many places. Fur-bearing animals are sufficiently numerous in this country to make fur trapping so attractive that several members of my survey party returned to the lower Peace river to trap during the winter.

In township 105, just north of the twenty-seventh base line some fossilized remnants of trees were found. Shale outcroppings were also noticed at the edge of Peace river in this district.



## APPENDIX No. 27.

## ABSTRACT OF THE REPORT OF L. E. FONTAINE, D.L.S.

MISCELLANEOUS SURVEYS AND INSPECTION OF CONTRACTS IN THE PEACE RIVER DISTRICT,  
ALBERTA.

I left home on May 20 for Edmonton, Alberta, where I outfitted and organized my party. On June 11, I left for Spirit River settlement, travelling by the Canadian Northern railway to Athabaska, thence by the Northern Transportation Co.'s steamer to Grouard, at the west end of Lesser Slave lake, and from there on by means of my own transport to our destination, which we reached on July 8.

As a number of squatters had located on the unsurveyed part of township 78, range 6 west of the sixth meridian, subdivision in this township was urgently required. While running the necessary outlines, I noticed that the south third of township 79 range 6 was also well suited for settlement, I therefore, decided to subdivide it. I completed the surveys in these townships on September 15.

The next surveys undertaken consisted of the examination of partially dry lake beds in townships 71 and 72, ranges 5 and 6, together with the surveys of four islands along the course of Wapiti river in township 70, range 7.

On the completion of these surveys I was advised that survey contracts in the district were ready for inspection. I therefore inspected contracts Nos. 3, 1 and 2 of 1913, in the order mentioned, and then returned to Peace River Crossing where I arrived on December 9.

While in that vicinity I ran that part of the east outline of township 83, range 22, west of the fifth meridian, not already run and completed the subdivision of township 84, range 21. I suspended operations on January 7, 1914 and left for Edmonton where I arrived on the 17th.

The district through which I worked appears to have a great future in store for it. Great changes have taken place during the past twelve months and if railway construction progresses as rapidly as expected this part of the country will soon have the benefit of railway facilities which should greatly assist in its future development, and afford innumerable openings for private enterprise.



## APPENDIX No. 28.

## ABSTRACT OF THE REPORT OF J. S. GALLETTY, D.L.S.

## SURVEYS IN THE FORT VERMILION DISTRICT.

The greater part of my work, during the summers of 1912 and 1913 and the intervening winter, consisted of the subdivision of townships in the Peace river valley in the vicinity of Fort Vermilion.

On February 12, 1912 I arrived in Edmonton where I organized my party.

Supplies sufficient for eighteen months were ordered, the major part being shipped direct to North Vermilion. Some difficulty was experienced in getting men to hire for the length of time desired. This may have been partly due to the fact that there were several other parties organizing at the same time, and that I could offer only the same rate of wages as those who were going out for one season. Finally, however enough men were found willing to engage for two years' work and we were able to make a start on the afternoon of February 28.

My assistant, Mr. J. H. Patterson was in charge of the party till they reached Athabaska. In the meantime I settled my affairs in Edmonton and then proceeded to Athabaska arriving there before the outfit and in sufficient time to arrange accommodation for it. I engaged freighters there to take us to Peace River Crossing. Mirror Landing was reached on the 7th. and Sawridge two days later. At the latter place we pitched camp and made a survey of Dog Island in Lesser Slave lake opposite the entrance to Lesser Slave river.

This survey with its connection to the township in which it lies occupied about two days, and we were able to proceed on our way on the morning of the 13th. The trails were good and we had but little difficulty in reaching Peace River Crossing, where we arrived on the night of March 19.

Next day we commenced work, retracing part of the survey of the Peace River Landing settlement. The following afternoon I went to examine the north boundary of section 19, township 83, range 21, to see if conditions on the ground were such that a road could be opened up, by producing this line through lot 41, of the addition to Shaftesbury settlement. Such a road would run over the high bank of Peace river. As it was with difficulty that my assistant and I walked up this hill at the point where the line would cross, I concluded that I would not be justified in putting this line through.

Navigation on Peace river usually opens about the beginning of May, so that I had at least five weeks in which to work in this vicinity before I could proceed to Fort Vermilion. With this in view I laid out the work in what seemed to be the most advantageous manner.

While the packers went to Spirit River settlement for the remainder of our transport outfit, I employed the rest of the party in running the north boundary of township 83, range 21. On the return of the packers we moved north to run the east boundary of township 84, range 21.

In the meantime I was trying to arrange for some means of transport to take us to Fort Vermilion. I was strongly advised against rafting and there was only one scow in the vicinity. The price asked for this was \$400.00 which I considered unreasonable; moreover it was not large enough to take all the outfit. After some delay I obtained the use of two scows which were brought from Fort Vermilion by the steamer, but they



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did not arrive until late in May and it was June 1 before we could start on our journey north. Before leaving Peace River Crossing we completed the south third and all the portion west of Peace river in township 84, and the north third of township 83, range 21, together with a school site and a site for the Church of England mission. I would have preferred to have made the last two rectangular in shape but conditions on the ground were such that to have done so would have been to defeat, to a great extent, the purpose for which they were intended.

We were fortunate in our passage to Fort Vermilion, as we took only three days and a half to make the journey of 300 miles. We travelled continuously day and night, with the exception of two stops of about six hours each, one when we tied up the first night and the other when a strong head wind drove us into the bank and compelled us to stay there till it subsided.

We arrived at North Vermilion on the morning of June 5, and after we had unloaded and stored our supplies in a warehouse lent us by Messrs. Revillon Freres. I returned the scows to the Hudson's Bay Co. across the river. Next day we moved into township 109, range 13, to commence subdivision.

My next step was to endeavour to locate the different settlers who were occupying unsurveyed lands in this district. The settlers themselves lent no aid in this matter: they were at first not only indifferent, but in some cases actually tried to avoid the survey altogether. It was not until late in the summer that I acquired a fair knowledge of their approximate positions. As I found that they were stretched over a range of territory from township 107, range 15, to township 109, range 11, and nearly all close to Peace river, I thought it best to leave this part of the work till the river was low.

We continued the subdivision in townships 109, ranges 14, 15 and 16, as we found a good stretch of country just north of the south branch of Boyer river, and as part of the first and last of these townships was desired for Indian reserves. By the beginning of October our surveys had reached Prairie point, in township 107, range 15, and from there we gradually worked our way along Peace river as far as township 109, range 11, surveying all the lands actually occupied. It was not till July of the following year that this work was completed.

In March, 1913, I sent a small party, in charge of my assistant, to traverse Boyer river, and in June I took another small outfit and went back to do the mounding we had left during the winter months.

Our horses were wintered at North Vermilion, as this was the most central point, and it was also the base of our supplies. Stable accommodation was scarce and therefore expensive, so that when Revillon Freres offered to provide the land and the logs for a stable and give us the use of the building on condition that we would provide the floor and roof and perform the labour, I accepted the offer. The season of 1912 was poor, and I had considerable trouble getting the amount of hay necessary to put the horses through the winter.

In July, 1913, we left Fort Vermilion to go to the post at the junction of Mikkwa (formerly Red) and Peace rivers, in order to survey some land in that vicinity which were desired for an Indian reserve. While passing the Vermilion chutes, I was met by a settler there who asked to be included in the survey. In order to do this I had to omit part of the work on the reserve at Fox lake.

We arrived back at the Vermilion chutes at the beginning of September and surveyed here a sufficient area to include one settler, though we were unable to include his partner, due to the latter's absence at the time of the survey.

During that month I received information that a guide whom I had engaged to take me overland to Trout lakes, was sick and would be unable to accompany me; I therefore had to arrange to have my party taken out by steamer over the usual route.

With the expectation that a steamer would be leaving Fort Vermilion for Peace River Crossing on September 27, we left the chutes on the 20th for Fort Vermilion,



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and arrived there on the 26th. Our information was incorrect, and after waiting in vain for a steamer we left Fort Vermilion in company with J. R. Akins, D.L.S., and his party on October 4. The steamer passed us on the 6th on its way to Fort Vermilion, and picked us up on its way back on the 12th, permitting us to reach Peace River Crossing on the 17th. We had difficulty in obtaining teams to take us to Grouard, but we managed to leave on the 19th. The trail was in bad shape, and it took up seven days to make the trip of ninety miles. We left Grouard on the 28th, and after considerable trouble reached Edmonton on November 3.

Most of the country surveyed at Peace River Crossing was very rough, and would be suitable only for grazing or mixed farming. The surface is covered usually with poplar varying in size from scrub to about twelve inches in diameter, with willow underbrush and occasional spruce. The soil, which is second-class, usually consists of about four inches of black loam overlying a stiff blue clay. On the west bank of Peace river, just north of Peace River Crossing, there is an extensive outcrop of sandstone of reddish colour which is suitable for building material.

At Fort Vermilion, most of the country is covered with a growth of poplar varying in size from scrub to about fifteen inches in diameter, with willow and spruce, the latter reaching a maximum of about twenty-four inches. Some open patches occur in every township surveyed, but with the exception of townships 109, ranges 11, 14, 15 and 16 they are almost entirely taken up by the present settlers. The greater part of the settlement is in townships 108, ranges 13 and 14 and many farms can be seen there which would do credit to a community much nearer railway communication.

The country is generally level, the only hills being on the banks of Peace and Boyer rivers, where they are seldom more than fifty feet high. With the exception of township 109, range 11, there is a good wagon road leading into each township from one of the settlements.

The soil which is a light sandy loam except on a few river flats where the black loam is found to a considerable depth, is usually about four inches deep overlying a sandy clay mixutre. It is especially a wheat-growing soil, and it has in some instances yielded large returns. There is a slight amount of alkali all over the district, but in the majority of cases, it does not seem to produce evil effects.

It has usually been assumed that wheat can be grown successfully there every season, but this is open to doubt. The crop for 1912 amounted to about 500 bushels, an average of less than one bushel for each acre sown. This was due mainly to lack of rain, but a severe frost in July did not improve matters any. Mr. R. Jones, who is in charge of the experimental farm at Fort Vermilion, states that wheat can be successfully raised every season and that lack of methods suitable to the needs of the district is the cause of most failures. Those in charge of the Roman Catholic mission, however, state that a crop is sure only once in five years, and the evidence would indicate that this is more nearly correct.

On account of the recent failures of the wheat crop, the flour mill of the Hudson's Bay company has been temporarily shut down.

Oats seem more difficult to raise than wheat, but barley is probably the surest of the grain crops. Rye has never been tried in this district. Potatoes, turnips, mangolds, carrots, sugar beets, cabbage, cauliflower, and celery do exceedingly well. Tomatoes ripen occasionally. Small fruits such as currants, raspberries, etc., thrive, but strawberries have not been successful. Flowers are among the successes of the district, and many varieties are to be seen blooming in the garden of the experimental station at Fort Vermilion. Timothy and broom grass grow well, but alfalfa is always a failure.

Slough hay or upland hay is difficult to obtain anywhere near the settlements and most of the settlers are drawing their hay from a considerable distance.

Horses, cattle and hogs are plentiful in the district and do exceedingly well. Considerable numbers of the horses rustle all winter, but it is usual to feed the cattle during the extremely cold weather.



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At the present time these animals may be purchased at a reasonable price, but any sudden demand would cause the price to rise considerably. Chickens are successfully raised in this district, but wolves, coyotes, foxes and dogs are too plentiful at present to permit sheep-raising.

One has to go a considerable distance from the settlement to obtain much game, but we saw signs of mink, marten, weasels, foxes, coyotes and wolves. Black bears and moose were seen on several occasions. Ducks, prairie-chickens, ruffed grouse and ptarmigan were the only feathered game seen.

No coal of any kind was seen but wood is everywhere plentiful for fuel though in some of the most settled parts of the community it has to be hauled a considerable distance.

No minerals of economic value were found, but there is a deposit of clay suitable for making brick, which has been used for that purpose within the limits of the settlement survey at Fort Vermilion.

The summers are comparatively cool and of late years have been remarkably dry, too dry in fact to permit successful crop raising. The temperature does not often exceed 75 degrees F. in the shade. The shortness of the season is compensated for by the long daylight which in the middle of the summer lasts about twenty-two hours.

Seeding commences about the first of May, and haying commences about the middle of July. By the end of September the weather turns decidedly cold and winter may be said to start with the beginning of October. Until Christmas the weather is not often excessively cold, though one may expect to see the thermometer register 40 degrees below zero occasionally. January and February are excessively cold, and temperatures from 30° to 70° below are prevalent during these months. In March the temperature rises, but owing to the high winds which prevail we found this the most trying period of the winter. By the end of April the snow is usually all gone even in the bush.

The average depth of snow during last winter in sheltered spots and in the bush was about eighteen inches, but on Peace river and on some of the open places the snow drifted to a considerable depth.

Mosquitos, black flies, and bull-dog flies are numerous in summer especially in swampy parts of the country.

The country surveyed near Mikkwa (formerly Red) river is poor. In the vicinity of Fox lake immense quantities of hay could be cut and this township would be best suited for ranching. The remaining country surveyed in the vicinity of Mikkwa river is largely flooded, the creeks having been dammed by beaver.

There are immense deposits of limestone at the Vermilion Chutes in township 108, range 6.

Peace river which flows through a large part of the country in which we worked varies in width from half a mile to about two miles, and its depth in places will reach fifty feet. It is open for navigation from about May 15 to October 15. Above Vermilion chutes the current is about three miles an hour, between the rapids and the chutes it is about six miles an hour and below the chutes about two miles an hour. Immense quantities of power can be developed at the chutes. Boyer river which empties into the Peace in township 109, range 12, will average about a chain wide and its depth will vary from a few inches to ten feet. Fish are scarce in these rivers, but can be obtained in large quantities from the lakes in the Caribou mountains about sixty miles from Fort Vermilion.

The Roman Catholic mission at Fort Vermilion in addition to the regular church work, conducts a boarding school for the children in the neighbourhood and there is a small hospital ward in their school building. The Church of England mission conducts two schools, one at Fort Vermilion and one at Stony point, seven miles from Fort Vermilion.

The Hudson's Bay company have a modern grist mill, and also a small saw-mill at Fort Vermilion.



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Mr. Sheridan Lawrence also has a small sawmill and grist mill, and rough lumber may be purchased at \$20 per thousand feet b.m. The Roman Catholic mission has small mills but these have not been in operation for some time.

The best route for a settler to take to Fort Vermilion is via Peace River Crossing. From Athabaska the usual route is followed along Athabaska river to Mirror Landing, then up Lesser Slave river to Sawridge, across Lesser Slave lake to Grouard, then overland to Peace River Crossing. From this point Peace river is followed to Fort Vermilion. A settler with an outfit will find it to his advantage to make the trip to Peace River Crossing in winter. He should arrive there not later than March 20, in order to take advantage of the roads when at their best, and also to get a raft assembled and ready to be put in the water when the ice goes out. It is the custom of the trading companies to send loaded scows from Peace River Crossing to Fort Vermilion on the first open water, and a settler with his raft and outfit ready could follow in their wake thus saving the expense of a guide. Rafting on this river is not to be recommended for a very large outfit. In such a case it would be advisable to ship by the steamers which ply on the river, or to obtain the use of scows if possible. The distance from Peace River Crossing to Fort Vermilion by river is 300 miles, and it usually takes six days on a scow or two days on the steamer to make the trip.

The Provincial Government has voted a sum of money to be spent on cutting a winter trail from Fort Vermilion to Trout lakes where it will connect with the winter trail from there to Athabaska, but this route is not yet open.



## APPENDIX No. 29.

## ABSTRACT OF THE REPORT OF G. H. HERRIOT, D.L.S

## BASE LINE SURVEYS IN NORTHERN MANITOBA.

My work during the past season consisted of the survey of parts of the eighteenth and nineteenth base lines west of the principal meridian.

I left Edmonton on February 20, 1913, for the purpose of taking in supplies to a point near the eighteenth base line. These supplies were purchased in Winnipeg and shipped over the Canadian Northern railway to Pas. I left Winnipeg for Pas on the 28th, arriving there the following day. I at once arranged with McMillan Bros., contractors on the Hudson Bay railway, to have my supplies freighted out along the right of way to a suitable point, where I proposed to cache them. It was, however, not until March 10 that three teams finally left Pas with my freight. The intervening time was spent in securing, from Hudson Bay railway engineers, prospectors, trappers and guides familiar with the country near Setting lake, all the available information covering this district, and preparing therefrom such sketch maps as were deemed useful. The North-west Mounted Police also furnished me with a record showing the earliest dates at which dog travel was possible in this region, for a period of several years prior to 1913.

Just here it may be pointed out that wherever a surveyor is dependent on the waterways of a country for his transportation any time spent in securing maps and information covering the area is well spent. It may save many long, round-about trips and much advance exploration on the part of the canoe men. The maps covering Northern Manitoba are in places very incomplete and very inaccurate and any additions, that can be made to them through the knowledge of those who have travelled new routes and waterways are to be strongly advised. It might also be suggested that a surveyor going into this district should familiarize himself with all the available reports covering this district.

On March 18 the freight reached McMillans' cache No. 13 at mileage 141 from Pas. I decided to leave my supplies in their care at this cache for two very important reasons. First, because it was located near where the eighteenth base line was expected to cross, and on the bank of Goose creek, a small stream navigable for large canoes from this point to the nineteenth base line, and second, because the supplies would be ensured against the danger of loss from thieves and fire, both of which were grave dangers in the vicinity of the right of way.

I went along with my freight in order to make sure that it would get through as far as I desired, and to be certain that such perishable supplies as the dried fruit and meats were properly cared for. In addition I hoped to add to my knowledge of the character of the country by personal observation.

After caching my supplies I returned to Pas, arriving there on March 24 and two days later left for Winnipeg which place I reached on the 27th.

On May 16 I again left my home for Winnipeg in order to organize my party so as to be ready for the departure of the first boat to cross lake Winnipeg.

On May 24, with a party of nineteen men, I left West Selkirk and after a rather exciting trip through large ice floes, we reached Warren's landing on the 26th. The Hudson's Bay company's boat did not arrive until the 28th, when we were permitted to load a small portion of our freight and my party in a York boat, and to tow my canoes behind. In this way we were towed down the Nelson, across Great Playgreen lake, and down the east branch of the Nelson to Norway House. The next two days



were spent in getting the remainder of the freight down to Norway House and storing it, and in trying to hire Indian guides to assist us down the river.

No Indian guides could be secured so we were compelled to find our way down the river to Cross lake the best way we could. My transport consisted of six large canoes and one small one. These carried about a month's supplies together with the surveying outfit and the camp equipment. At Cross lake I was able to engage two Indians as guides and on June 6 we proceeded down the Nelson, reaching the point at which the principal meridian crosses Sipiwesk lake, the following day. On the 9th my Indian guides piloted us up small winding creeks and across a small lake to our first camp, within a quarter of a mile of the northeast corner of township 68, range 1, west of the principal meridian.

This corner falls in a deep creek and is marked by a witness monument eight chains south. On June 10, after first retracing a mile of the meridian, the eighteenth base was turned off as an offset line, nine chains south of its theoretical location. After producing this offset line about half a mile west it was possible to turn north to the true base line. This was first opened back to the meridian and then its production westward was commenced.

The first thirteen miles of the base line entailed man packing, but the canoes were able to loop around from the end of the base line to a small lake, about the middle of range 1, which they entered by way of a small creek from Sipiwesk lake. Again supplies were brought by the canoes to within a mile of the muskeg lake in range 2. From the crossing of the first bay on Sipiwesk lake in range 3, until Bear island was reached in range 4, the canoes were used to shift camp, the next camp being made on Duck lake, which was reached by a mile portage from below Red Rock rapids on the Nelson over the height of land to Duck lake. A 300 yard portage from Duck lake to the Nelson below Duck falls, made it possible to use canoes as transport from this point until our last camp was reached on an island, near the eighteenth base line leaves the upper bay of Sipiwesk lake in range 6. There it was found that further production westward would entail a great deal of man packing and as the nineteenth base line offered excellent canoe routes, I decided to proceed to it immediately.

The following day we started across Sipiwesk lake, and down the Nelson on our way to the nineteenth base. We packed across Cross portage, which is one and a half miles long, put our canoes into a small lake connecting with Landing lake and following westward along the south shore of Landing lake, we reached the point where the principal meridian crosses that lake about noon on August 11.

The northeast corner of township 72, on the principal meridian, falls in Landing lake and is marked by a witness monument four chains south of its true position. On the afternoon of August 11, the nineteenth base was turned off as an offset line three chains south and parallel to its theoretical location, and produced across a bay of Landing lake. For the first ten miles of this base line canoes were used to transport the camp and supplies, the camp being moved frequently to bays of Landing lake in order to keep close to the end of the line. From Landing lake everything had to be carried one and a quarter miles across Thicket portage into Wintering lake, and the next fifteen miles of line were produced from camps located on small creeks flowing northward into Wintering lake. During the survey of the next six miles back-packing being necessary, only enough supplies were carried to last until the line should reach Halfway creek, in range 5. While the line was being opened across this stretch, the four canoe men were engaged taking the canoes and some of the freight around by Wintering lake across two very wet portages, one and a quarter miles in length, into Paint lake and thence up Grass river and Halfway creek to our anticipated crossing. The canoe men had each to handle a large canoe and tow a small canoe. In crossing Wintering lake they encountered a very heavy wind, and the small Peterborough canoe broke its tow line and was swamped, attempts to recover it proving futile. Halfway creek and Grass river were used for moving camp until the last crossing of



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a bay of Grass river in section 34, range 6, was reached. From this point man packing was again resorted to, although an attempt was made to bring in supplies by Soab creek and Frozen lake.

On October 11, the nineteenth base line had reached a point about thirty-five chains west of the northeast corner of section 35, township 72, range 7. The muskgs in ranges 6 and 7 were very wet, and the snowfall on October 10 so protected these from frost that a delay seemed inevitable. This combined with the rapid approach of winter, made it advisable to close operations on the nineteenth base line and to return to the eighteenth where it had been discontinued on the west side of Sipiwesk lake. It was therefore decided to start back on October 13. The party returned over the first stretch, back-packing the necessary supplies, consisting of the camp equipment and surveying outfit, to a point where the canoes had been left. Four of the party made the trip to Frozen lake about three miles south of the northeast corner of township 72, range 7, where they picked up one of the canoes which had been left at that point, and started to make their way to the mouth of Soab creek. Ice was soon encountered, however, and they were compelled to leave the canoe and pack across to Grass river, where they met the remainder of the party with two large chestnut canoes. From this point on the progress was very difficult, it being necessary in places to drag the canoes over the newly-frozen ice. Finally, however, the canoes had to be left behind and along with them the iron posts, instruments, and part of the camp equipment. The remainder of the outfit, including the men's beds, sleeping tents and enough supplies with which to reach the right of way, had to be back-packed. Several days of very trying travel ensued, caused by the heavy loads and the many wide detours around open lakes or bays. Not infrequently men broke through the ice on the lakes, each of which was a source of danger and delay. However, on October 20, the Hudson Bay railway was reached at a point not far distant from McMillans' cache No. 14. The following day the party arrived at cache No. 13, where an abundant supply of food was stored.

In September while still at work on the nineteenth base line the cook and two Indians left the party thus reducing it to seventeen men. Moreover, the Hudson's Bay company wrote advising me that it was impossible for them to purchase the dogs I had asked for. It was therefore necessary for me to go to Winnipeg in order to purchase my transport outfit for winter work and to hire more men. Accordingly on September 14, I left the party in charge of my assistant and proceeded to Winnipeg, where I engaged five more men and purchased a number of dogs.

On October 3 I left Selkirk with my men and dogs and after many vexing delays arrived at McMillan's camp near Sipiwesk lake, on the 15th. Great difficulty was experienced in getting across Sipiwesk lake owing to the formation of ice in the bays and the calmer water of the lake. By October 20, we were able to get twenty-one dogs and the freight across the lake to a point a short distance west of where the Nelson flows from Duck lake. There we found that the whole western arm of Sipiwesk lake had already frozen, so that we could proceed no farther with the canoes. We therefore, endeavoured to return for the remaining ten dogs, but we found that the ice had formed so rapidly in our wake that immediate return was impossible. We accordingly cached the canoes, loaded most of our freight on the toboggans and started westward across the long bay of Sipiwesk lake to where the eighteenth base line leaves it. After a rather perilous passage during which the toboggans broke through occasionally, and frequent portages had to be cut out over different points in order to avoid the weak ice, we managed to reach the west shore by evening. The following day we proceeded due west, with two men cutting trail ahead of the dogs and on the evening of October 22 we reached cache No. 13, where the remainder of the party was awaiting us.

The following day the dog teams went north to pick up the outfit which the main party had been compelled to leave behind. New trails had to be opened so that it was



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not until four days later that the teams returned. The next day the outfit was moved east to within a mile and a half of what was then the end of the eighteenth base line. Each man had to pack his own dunnage as the transport was unable to handle everything in a single trip. On the 28th the production of the line was begun and the work went steadily forward without delay until January 5, 1914, when the northeast corner of township 68, range 17 was reached.

During this period of the survey, dog transport was used throughout. The supplies were hauled from McMillans' cache No. 13 and the dog feed consisting of fish was hauled from a cache on Setting lake. Six dog trains handled by four dog drivers were used during the first six weeks, and from then till the end of the survey five teams were used. The trips after supplies and feed were so arranged as not to interfere with the regular work of moving camp.

As soon as Setting lake was sufficiently frozen for fishing I started two of my regular men at work fishing for dog feed. The fish were very plentiful and by December 12, working with about a dozen nets, they were able to catch enough fish to supply the dogs till the survey was completed. About 4,200 fish, mostly whitefish, were taken during this period. Although the work of fishing reduced my party by two men, it was by far the cheapest method of securing dog feed. Moreover, it assured good wholesome feed and this kept the dogs in condition to handle the transport. As stated before, the northeast corner of township 68, range 17, was reached on January 5. As the supplies were then practically exhausted, and the limit of economical haul for our transport had been reached, it was decided to close operations. Accordingly on the following day we started for Pas which we reached on the 10th. There the men were paid off, each being allowed his time and fare to Winnipeg.

Taken as a whole the season of 1913 was only an average one for survey work. The months of July, August and September were decidedly wet, daily showers being quite the usual order. The month of October was exceptional as during the early part several snow storms were experienced, the heaviest of the year occurring on the 10th. On the 12th, the smaller lakes and creeks began to freeze up and by the 20th many of the larger lakes and swifter streams were frozen hard enough to be crossed by the dog trains. The heavy snowfall before the freeze-up so protected the swamps and muskegs that these did not freeze solid until near the end of November. The period following this heavy snowfall and until the muskegs became frozen was far from pleasant for work, as the men were constantly breaking through, but from the end of October until the completion of the survey in January the weather conditions were the very best. It is worthy of note that the freeze-up in 1913 was about six days earlier than any previous record for twenty-five years. The country traversed by the nineteenth base line in its production across the first six ranges is fairly uniform in character, except that it is much broken by large lakes, such as Landing, Wintering and Paint lakes. Ranges 1 and 2 are very similar in character. The surface is generally rolling and mostly dry, except along the shore of Landing lake, where it is more broken. The soil is a clay loam suitable for agriculture. The greater part of this area has recently been burned over, the surface soil being badly burned. To the north of the base line the country is broken by Landing lake, a beautiful rock-bordered lake about thirty miles long and from a half to one and a half miles wide, with a few deep bays breaking its otherwise regular contour. This lake is reached from Nelson river by way of Cross portage which is one and a half miles long, and from Wintering lake to the west, by way of Thicket portage, which is one and a quarter miles long. The surplus water of the lake finds its way into the Nelson to the east through Landing river. In section 32, range 2, the west shore of Landing lake is reached and from this point westward the timber is dense and consists of spruce, jackpine, poplar, willow and birch, with tamarack in the low places. Townships 73 and 74 in ranges 2 and 3, are much cut up by Wintering lake, with its many deep bays. This lake has a most irregular shore line with two deep bays, about eight miles long extending southwest. It is approxi-





Photo by J. S. Galletly, D.L.S.

#### Flour Mill at Fort Vermilion.

This flour mill, built and operated by the Hudson's Bay company, is said to be the farthest north flour mill in America if not in the world.



Photo by J. S. Galletly, D.L.S.

#### Bringing a Scow up Vernilion Chutes.

These chutes or falls are situated on Peace river about fifty miles east of Fort Vermilion. The total fall is about twenty-four feet, extending over a mile and a half; the falls consist of two rapids and one perpendicular drop, each of about eight or nine feet. Unloaded scows run down the chutes easily, but are seldom brought back, as the expense of taking one up is about as great as making or purchasing a new one.







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ately sixteen miles long and averages about two miles wide. Many islands add to its picturesqueness.

The surface of ranges 3 and 4, in townships 73 and 74, is more broken by rock ridges which frequently rise to fifty or sixty feet above the surrounding level. Adjacent to Wintering lake the Huronian rocks outcrop in many places. The soil in the less broken areas is clay overlaid with moss. In range 4, there is a large moss swamp interspersed with stretches of tamarack swamp. This range is therefore not suitable for agriculture. In range 3 the soil is much better, and areas suitable for agriculture are found close to the right of way of the Hudson Bay railway, which is crossed by the base line in section 35. McLaren creek which is about one chain wide and ten feet deep traverses this range and empties into Wintering lake. It drains McLaren lake which is three miles long and one-half mile wide.

Range 5 is broken by Halfway creek, a stream about sixty links wide, with a marked current which flows northerly through section 35 and connects with Grass river about four miles farther north. In section 31 a deep bay of Grass river is crossed. The river there appears to be a series of long narrow lakes, connected at the sides instead of the ends by a stream from fifty to one hundred feet wide. Where the stream is thus contracted the current is very swift and falls of from ten to forty-five feet, are not infrequent. The banks are in many places almost perpendicular cliffs, from ten to thirty feet in height. The surface throughout the range is rolling, rising at intervals into rock ridges. The soil on the ridges is rich clay wherever the rock does not outcrop, while in the hollows small muskegs occur. The general slope of the country is to the north, while the ridges run nearly due north and south. In section 33 a marked ridge occurs which is covered with very good spruce from ten to twenty-four inches in diameter. Elsewhere the country is densely timbered with smaller spruce, jackpine, poplar and tamarack.

Range 6 is very similar in its eastern half to the preceding one, while the western portion is more rocky, with more muskeg between the rock ridges. The line crosses another bay of Grass river in section 34. The last two miles of the range is practically all muskeg covered, in places, with water from one to two feet deep. The soil is clay loam on the ridges, but in the swamps this is covered by one or two feet of moss.

In range 7 the rocky ridges seem to continue to the west. Several small lakes could be seen to the south of the base line. The muskeg between the ridges was deeper and wetter than at any time earlier in the season, owing no doubt to the heavy rains and snowstorms in the latter part of September and the early part of October.

The first three ranges of the eighteenth base line west of the principal meridian are gently rolling, with the surface generally dry, and the soil is clay loam suitable for agriculture. A large portion of the country is covered with standing fire-killed timber, consisting of spruce and jackpine. When Sipiwesk lake is approached, however, this gives place to dense spruce, birch, poplar and willow. Throughout the next three ranges the base line crosses channels and bays of Sipiwesk lake. The soil is mostly clay on the islands and the timber is largely very dense small spruce, birch, poplar and jackpine. Across ranges 7 to 12, inclusive, the country is undulating, except where it is broken by the configuration of lakes such as Setting and Goose lakes, and by an occasional rocky ridge. In ranges 13 to 16, inclusive, the country is very broken by the frequent occurrence of rocky ridges which in general follow a northerly and southerly trend.

When the lakes in the district traversed by these two base lines are made accessible by the construction of the Hudson Bay railway, commercial fishing may become an important industry. These lakes, comprising Setting, Sipiwesk, Landing, Wintering, Cross, Paint, Wekusko and Halfway, together with Nelson and Grass rivers, teem with fine whitefish, jackfish and some lake trout, while Sipiwesk lake and Nelson



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river have long been famous for sturgeon. As the lakes are comparatively small it will, however, be necessary to guard these fisheries by the proper restrictions in order to avoid depletion of these waters.

Throughout the greater part of the country traversed practically the only merchantable timber to be found is in patches and fringes on the islands and along the lakes and rivers. The larger timber is mostly spruce but smaller spruce, jackpine, poplar and birch suitable for pulp wood is to be found almost everywhere.

It is only in recent years that the great clay belt, of which this district forms a part, has been known to exist, and the average citizen to-day still regards this clay area as more or less of a myth. However, the existence of it has been proven beyond all doubt. Although the season of growth may be shorter than farther south, the longer hours of daylight more than compensate for this short season. Experience has shown that most garden vegetables can be grown, as evidenced by the gardens at the two Hudson's Bay company's posts at Nelson House and Cross Lake. The Nelson House post is situated north of the district traversed by the eighteenth and nineteenth base lines while Cross Lake post is south of it. Wheat, oats and barley have been successfully grown, on a small scale, at Cross Lake. The surface of the country is generally rolling and even where only gently undulating, there seems to be sufficient slope to make drainage possible.

It is the hope of those who are interested in the development of this district that minerals of economic value will be found. There is considerable to encourage that hope, as the area traversed by our survey, is crossed by several belts of Huronian rocks. The most important of these are belts at the north end of Wekusko lake and around Wintering lake. Prospectors have been busily engaged around Wintering lake so that now nearly all the land fronting on the lake has been staked as mineral claims. The chief indication is of copper with its allied minerals. Development alone can determine whether or not these claims will prove of any commercial value.

Water-powers in the immediate vicinity of the lines surveyed are to be found on practically all the streams and rivers. The more important ones, however, are those on Nelson and Grass rivers. Those on the Nelson are by far the most important on account of the great volume of water. A table covering the falls on Nelson river compiled from the 1911 report of the Conservation Commission, is given below:—

Name of Rapid.	Approximate Head in feet.	Estimated Horse-power.
Limestone rapid.....	85	1,140,000
Long Spruce rapid.....	85	1,140,000
Kettle rapid.....	96	1,290,000
Gull rapid.....	67	900,000
Birthday rapid.....	24	320,000
Grand rapid.....	20	270,000
Rapids above Sipiwesk lake.....	31	416,000
Bladder rapid.....	10·6	147,000
Whitemud rapid.....	30	403,000
Ebb and Flow rapid.....	11	148,000
Rapids above Cross lake.....	45	605,000

These figures are based on a volume of 118,369 cubic feet per second at low water, determined by measurements taken across Nelson river just below Sipiwesk lake. Below the point where these measurements were taken the Nelson is swollen by such rivers as Clearwater, Armstrong, Grass, Burntwood, Kettle and Limestone. These rivers would materially increase the volume and therefore the horsepower of all rapids below Split lake, including Birthday, Gull, Kettle, Long Spruce and Limestone.



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No definite data can be found covering the falls on Grass river, but the following is a table showing the approximate height of the falls between Reed and Paint lakes.

Location or Name of Rapid.		Approximate Head in feet.
1st Rapid below Reed lake.....		10
2nd " " " ".....		6
3rd " " " ".....		48
1st " " Wekusko lake.....		12
2nd " " " " (known as Kanisoto or 2 Rapids).....		15
3rd " " " ".....		8
4th " " " " (known as White Forest).....		
5th " " " " ( " " Skunk).....		
6th " " " " ( " " Whitewood).....		40
1st " " Setting " ( " " Sasagin).....		12
2nd " " " " ( " " Pisew or Lynx Falls).....		50
3rd " " " " ( " " Kwasitchewan Falls).....		45

Halfway creek although carrying only a comparatively small amount of water has five distinct falls ranging from three to fifteen feet.

To anyone familiar with river navigation the number of rapids as indicated above suggests very definitely a great many portages. Portages are without a doubt the curse of river transportation. Throughout the season my canoe men crossed over the portages given below, and in several cases some of these portages were travelled a number of times.

Name or Location.	Approximate Length of Portage.
Sea falls on Nelson river.....	150 feet.
Sugar falls on Nelson river.....	300 "
Three small rapids on Nelson river.....	30 to 50 feet.
Ebb and Flow " " ".....	$\frac{1}{4}$ mile.
Whitemud falls " " ".....	Nearly $\frac{1}{2}$ mile.
Bladder rapid " " ".....	$\frac{1}{4}$ mile.
Over the Hill " " ".....	300 feet.
Red Rock rapid " " ".....	Either 2 portages 50 and 300 feet or $\frac{5}{8}$ mile.
Chain of Rocks " " ".....	100 feet.
Cross Portage from Nelson river to Landing lake.....	$1\frac{1}{2}$ mile.
Thicket Portage from Landing lake to Wintering lake.....	$1\frac{1}{4}$ mile.
Portage from Wintering lake to small lake between Wintering and Paint lakes.....	$1\frac{1}{4}$ mile.
Portage from same small lake to Paint lake.....	$1\frac{1}{4}$ mile.
Six small portages on Halfway river, each.....	About 100 feet.
Portage to avoid Kwasitchewan falls, Grass river.....	$\frac{1}{4}$ mile.
Portage from Grass river to Halfway lake.....	$1\frac{1}{4}$ mile.
Strawberry portage from Thicket river to Jim creek.....	2 miles.
Portage from Leach lake to Halfway lake.....	3 miles.
Portage from Nelson river to Duck lake.....	1 mile.
Portage from Duck lake to Nelson river below Duck falls.....	300 yards.
Portage past the first rapid above Duck lake.....	$\frac{3}{8}$ mile.

Of the fur-bearing animals, mink, foxes (red and black, silver and cross), lynx, wolves, weasels, muskrats and beavers are to be found in great numbers. The winter of 1913-14 has been an especially good one for foxes of all shades and colours. Red foxes were taken in great numbers and nearly every trapper had taken at least one or more silver foxes and not a few cross foxes. Black bears, otter and martin although not plentiful are to be found in the district. Moose and the woodland caribou are quite common although not nearly so numerous as in some parts of the country. Some jumping deer were seen in the valley of Grass river. Wild fowl such as geese and ducks are to be found on the lakes and rivers, but not in great numbers. Several varieties of grouse are fairly numerous.



## APPENDIX No. 30.

## ABSTRACT OF THE REPORT OF A. E. HUNTER, D.L.S.

## SURVEYS IN THE RAILWAY BELT, BRITISH COLUMBIA, IN THE VICINITY OF YALE.

I organized my party at Kamloops and proceeding from there located my first camp at Saddle Rock, five miles south of Spuzzum, on May 18, 1913. On the following day the survey of the east boundary of township 8, range 26, west of the sixth meridian, was commenced from the northeast corner of section 1.

The hills along this boundary are very precipitous, and some difficulty was experienced in obtaining men suitable for carrying on the work.

Having completed the survey of the lands adjoining the Canadian Northern railway right of way in this locality, camp was moved five miles north on June 26.

On August 6 camp was again moved across to the right bank of the Fraser, and as the cables and ferry in this vicinity had been carried away by the high water in June, canoes had to be used for crossing.

On September 2 camp was moved to Camp Sixteen, and here the crossing of the Fraser was greatly facilitated by making use of a cable car formerly operated by the Northern Construction company. At Camp Sixteen the Canadian Pacific Railway company has in operation a stone-quarry, and grey granite of excellent quality for building purposes is shipped from that point.

On November 21 I moved to Spuzzum, and on the 24th completed the survey of Spuzzum townsite.

While engaged in this latter work I received instructions to retrace the Canadian Pacific railway through townships 10 and 9, range 26. I completed this retracement on December 3.

I then completed the survey necessary for the disposition of lands adjoining the Canadian Pacific and Canadian Northern railways in township 10, range 26.

The season was then too far advanced to do further work advantageously, so operations were brought to a close on December 15.

The general characteristics of the country along Fraser river in townships 8, 9 and in township 10 as far north as the north boundary of section 14, range 26, are very similar. The hills rise abruptly from the river or from narrow benches along the river, and are cut through by small streams in deep canyons. Level or slightly sloping benches of a few acres in extent are found in places along the river, but the greater part of these arable areas has been set aside as Indian reserves or surveyed into Group Lots.

The soil on these benches is generally a sandy loam with a sand or gravelly subsoil overlying the solid rock, and although the rainfall in May and June is abundant, the drainage is so rapid that a few hot days in July are sufficient to destroy the vegetation. When properly irrigated, however, the land is very productive and the common vegetables and fruits may be grown to advantage.

Many of the Indian reserves appear to be deserted, the results obtained from cultivation apparently being incommensurate with the outlay for irrigation.

Fir from two to five feet in diameter is found on the benches and creek valleys and in strips on the rocky hillsides, but the timber on the benches has been fairly well culled in the construction of the railways. On the hills, the timber is too difficult of access to be taken out conveniently. Some cedar and hemlock are also found, but not in great quantities.



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Some prospecting has been done for gold in the southeasterly part of township 8, range 25, but although surface indications appeared favourable, no strikes of any importance have been made.

Salmon of many varieties come up the Fraser as far as section 27 in township 9, but the river above this has been so filled up in places by the construction of the railroads as to exclude all but a very small percentage of the fish which have run that far.

Marten, bears, deer, mountain goats, rabbits and partridges are found in the hills adjoining the river.

In the construction of the railroads the wagon roads in these townships have been so cut off as to render wagons practically useless except for short hauls.



## APPENDIX No. 31.

ABSTRACT OF A REPORT ON THE SURVEYS PERFORMED BY THE LATE  
C. E. JOHNSTON, D.L.S., PREPARED BY HIS ASSISTANT  
A. D. STEWART.

## STADIA SURVEYS AND INVESTIGATION OF LAKES NORTH AND EAST OF SWIFT CURRENT.

The party left Swift Current the place of organization, on May 30, 1913, to commence work near Ernfold in township 17, range 7, west of the third meridian. From that town, the party worked eastward, and investigated the lakes in a block of about thirty townships in the vicinity of Chaplin.

While traversing Chaplin lake, wooden witness posts were placed at points in fractional sections 3, 4, 8, 9, 16 and 17, of township 17, range 5. It was found that the south half of this lake becomes dry during part of the year so it was not traversed.

While investigating townships 22, ranges 2 and 3, instructions were received to traverse the group of lakes formerly known as Red Deer lakes. Accordingly on October 20 camp was moved to Macrorie, in township 27, range 8, and work was started at Coteau lake, the most southerly of the group on the 23rd. The adjoining townships were investigated, and on November 20, the party moved to township 26, range 11 and examined this township and township 26, range 10.

Camp was then moved back to Macrorie, and later on to Manna and Luck lake, while townships 24 to 26 ranges 7, 8 and 9 were investigated and their lakes traversed. Luck lake was not traversed as it was found to dry up each year.

On December 29, the party returned to Macrorie where the outfit was left and where arrangements were made for wintering the horses; we then moved to Moosejaw where the party was disbanded.

The townships surrounding Chaplin have for the most part good agricultural soil of sandy or clay loam. The surface however in townships 18, ranges 4 and 7 and townships 17 ranges 2 and 3 is to a large extent heavily rolling. In the immediate vicinity of Chaplin lake while the soil is very light, south of the lake the country is very dry and fresh water difficult to obtain. Although the area of this lake has decreased considerably owing to its gradual subsidence, the greater part will apparently always remain useless, and the remainder will for the most part be suitable only for grazing purposes for some years.

In several townships there seems to be arable land which is still open to settlers. Except just north of Parkbeg and at a few other odd points, the farm buildings are not as large and prosperous looking as those in other parts of the country the one-room shack seems to predominate.

Thunder creek valley which lies about twelve or fifteen miles northeast of Chaplin lake seemed prosperous, with large farms, and good soil. The valley seems to be thickly settled, and there is apparently no open land except school lands or Hudson's Bay Co. property. The buildings are nearly all large and provide generously for live-stock and crops.

Around Coteau, Stockwell and Anerley lakes the open land has been nearly all taken up. There is a good deal of what appears to be fine farming land still vacant, but it is held by speculators and the railway companies. The soil is generally sandy to clay loam. The buildings are not all that could be desired but as the land is proved up and the owners' financial positions improve the homesteader's shack is gradually giving way to comfortable homes and larger farm buildings.



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In the neighborhood of Luck lake the soil is sandy or clay loam. The district is well settled, the lake being surrounded by prosperous-looking farms with ample and attractive buildings.

During the past year there seems to have been a general financial depression apparently due to poor crops and the low price of wheat. Oats were grown by some farmers and this crop did not seem to suffer to the same extent as the others. The price given for wheat in the fall months by the local elevators was generally 65 cents a bushel. Twenty-five bushels to the acre was considered a heavy crop for the districts passed through and fifteen to twenty bushels was the average.

Vegetable growing does not seem to be in favour in these parts of the province and the towns have to send away for such as they need. Potatoes were very scarce. One farmer had obtained only three bags where previously he had over one hundred. The price varied from 75 cents a bushel in summer to \$1.50 in winter.

Chicken raising seems to be successfully carried on and turkeys and ducks are also commonly seen. Fresh eggs are generally hard to obtain and sell at from 30 to 40 cents a dozen as a rule.

A prairie fire which originated some distance west, burned out a few settlers in townships 25 and 26, ranges 9 to 11 and caused losses to others of haystacks and pasturage.

Hail destroyed the crops southwest of Dinsmore, but only touched a few sections of township 26, range 11.

The farmers in the district surveyed seem favorably inclined toward mixed farming, and all spoken to were unanimous in saying that it will prove the most paying proposition in the long run.

Despite the poor crops of the past year, the settlers are of the opinion that a good crop this year will prove a panacea for all financial ills.

The lakes and ponds in the districts examined are generally dried up. Ponds and marshes that formerly had some depth of water all the year round are dry now for a good part of the year. In fact in late summer and fall the settlers in some districts have to go quite a distance to obtain water.

Most of the bodies of water investigated had at least traces of alkali, generally too much for domestic use though not enough to prevent its use for stock. Fresh water was found fairly often though non-alkaline stagnant water was seen only a few times.

No signs of minerals, quarryable stone, oil or natural gas were noticed.

In the townships investigated, bituminous coal is the common fuel. The Canadian Northern Railway company is introducing lignite but as yet it is not extensively used.

Lumber is imported into all these townships as there is no bush. Along South Saskatchewan river, there are a few small trees up to two inches in diameter, and the settlers for long distances around haul this brush for kindling purposes. The growth is being rapidly cut down and will probably be gone in a few years if no attempt is made at conservation. There also a few small clumps of bush scattered along the group of lakes which comprises Coteau lake and those lying to the west of it, but the trees are not over two inches in diameter; in fact there are very few approaching that size.

A branch of the Canadian Northern railway between Elrose Junction and Elrose, about forty miles west of Macrorie has been completed and put in operation, and several new towns are springing up along it. The line has also been continued from Macrorie through Elrose Junction to Dunblane, a new settlement in township 26, range 7.

The branch of the Grand Trunk Pacific railway from Moosejaw to Mawer in the Thunder creek valley is also constructed and in operation.

The Canadian Pacific railway line running north from Chaplin through the upper Thunder creek valley in township 20, range 6 has been surveyed, and location stakes of



various other projected lines were also seen. In the vicinity of Luck lake several lines were run and some were noticed also near Dinsmore.

In Thunder creek valley lines have been surveyed for the Moosejaw water-supply canal.

If this proposition be carried through as projected, it should afford opportunities for the generating of cheap electric power.

Well-graded roads lead north and south from Ernfold on the Canadian Pacific railway, and some good roads run north of Chaplin. A road with the necessary bridges has been built south across Chaplin lake, but it is poor on account of the sandy soil. Another trail leading southeast is poor for the same reason. Three good trails lead out from Ernfold, one to Parkbeg, one to Tugaske and one in a northerly direction. Roads were surveyed during the season west of Chaplin lake and south from Parkbeg through township 17, range 2 into township 16, range 2, where there are now several good roads. North of Thunder creek valley there are generally good roads or trails in all directions. From Tugaske good roads run to South Saskatchewan river, and on the north bank of the latter at Elbow trails lead off in several directions through the sand hills which make hauling very heavy. Around Luck and the group of lakes consisting of Coteau, Stockwell and Anerley, the roads and trails are very fair except in townships 25 and 26 ranges 9 and 10 where there are only poor trails through rolling country.

Exceptionally fine weather prevailed all summer and fall. In the latter part of December it became threatening, and it was decided to close operations on completion of the work then in hand.



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## APPENDIX No. 32.

## REPORT OF W. J. JOHNSTON, D.L.S.

SUBDIVISION IN THE YALE DISTRICT OF THE RAILWAY BELT, BRITISH COLUMBIA.

CHASE, B.C., July 24, 1914.

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa, Canada.

SIR,—I have the honour to submit the following report on my work for the season of 1913.

I left Vancouver for Hope, in township 5, range 26, west of the sixth meridian, on May 12, 1913, via the Canadian Pacific railway, and established my first camp on the north side of Fraser river, near Hope station. There I completed what subdivision was possible, traversed a few miles of the right bank of the Fraser and retraced the boundaries of a few Indian reserves. On May 30 I moved my camp across the river and began subdivision there. The boundaries of a few Indian reserves were retraced and provincial lot No. 873 was surveyed. The left bank of the Fraser in section 34 and an inland at the mouth of Silver creek were traversed, and the points of intersection of all surveyed section lines with the Canadian Pacific and Canadian Northern railway lines were determined. These railways run almost parallel on opposite sides of the Fraser.

From this camp I also subdivided part of township 6, range 26, on the east side of the Fraser, and traversed the left bank of the river. For transport we used a hand car on the Canadian Northern railway track, which was laid and ballasted at that time.

On July 26 I moved my camp by wagon to Choate siding over the old Yale-Cariboo road, which is gradually getting into bad shape through neglect. There I commenced subdivision on the west side of the Fraser in township 6, range 26. The boundaries of the Indian reserves and provincial lots were retraced, and Strawberry island and a portion of the right bank of the Fraser were traversed. The points of intersection of all surveyed section lines with the Canadian Pacific railway were determined.

On August 21 we moved to Yale over the Yale-Cariboo road. From this camp I subdivided lands on both sides of the Fraser, in township 7, range 26, and traversed both banks of the river through the Yale canyon. I used a hand car over the Canadian Pacific and Canadian Northern railways for transport. The work in this township was rather difficult and slow, owing to the rugged nature of the country.

The valley through townships 5, 6 and 7, range 26, averages about a mile in width, though in many places the mountains run down to the water's edge. The land is covered with scattered fir, cedar, and spruce up to three feet in diameter, with a heavy undergrowth. The soil is a sandy loam with a gravel subsoil. The best land is taken up by Indian reserves and provincial lots, and in most cases no development has been made on them. Irrigation farming is being undertaken on lot 65, group 1, and it is proving a success. Fishing is good in the mountain streams, mountain trout being very plentiful, though small. There was a large run of salmon in the Fraser during the months of July, August, and September. Game was rather scarce. Though deer are more plentiful in the fall, when they are driven down by the snow.



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No water-powers were seen. Mosquitoes are very scarce, owing to the streams being so cold and swift. There was a heavy rainfall during the summer months, chiefly at night.

On October 6 I moved my camp via the Canadian Pacific railway to Hope, from where I retraced two miles of Indian reserve boundaries on Yale Indian reserves Nos. 13 and 14. While there we experienced almost two weeks of steady rain.

On October 16 we moved by wagon to St. Elmo over the Yale-Westminster road, which is in good condition. From this camp I ran a few miles of subdivision in townships 4, ranges 27 and 28 and traversed some islands in the Fraser. The soil is a sandy loam, and is very rich. The valley on the left of the Fraser extends back about a mile and is covered with timber, chiefly of second growth. Mixed farming is followed and there is an abundance of fruit.

On November 3 we moved to Pitt river over the Canadian Pacific railway and by launch up Pitt river to Pitt lake in township 4, range 5, west of the seventh meridian. There I surveyed timber berth No. 559. This berth is at an elevation of 3,000 or 4,000 feet and is very rough in places. Some fine cedar, fir and hemlock, up to four feet in diameter, were seen. Owing to a two-foot fall of snow I had to abandon the work before completion and return to Ruby creek where I arrived on November 28.

There we began subdivision in township 4, range 28 and township 5, range 27, west of the sixth meridian on the right bank of the Fraser. In township 4, range 28, the land was rough and mountainous to the river's edge. The right bank of the Fraser was traversed.

Only a few miles of subdivision were run in township 5, range 27. There is very little farming being done there yet, but some good land was subdivided. The soil is a sandy loam with a gravel subsoil.

On December 20 I disbanded my party and returned to Vancouver.

I have the honour to be, Sir,

Your obedient servant,

W. J. JOHNSTON, D.L.S.



## APPENDIX No. 33.

## REPORT OF G. J. LONERGAN, D.L.S.

INSPECTION OF CONTRACTS IN ALBERTA AND NORTHERN MANITOBA.

BUCKINGHAM, QUE., February 21, 1914.

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa, Can.

SIR,—I have the honour to submit the following general report on my last season's operations.

My first work was the inspection of contracts Nos. 14 and 15 of 1912, comprising the townships through which Carrot river flows in ranges 7, 8, 9 and 10 west of the second meridian. From Tisdale we followed a well-graded road almost due north to Arborfield passing through a well-settled district where mixed farming is successfully followed. From Arborfield the only trail running to the northeast is the one made by the surveyors. It passes through a country that was at one time heavily timbered but fires destroyed the timber about fifteen years ago, and there is now a second growth of poplar and willow, scarcely exceeding four inches in diameter, with considerable windfall in places. The soil is chiefly a loam from three to five inches in depth with a clay subsoil and the surface is almost level. There is ample drainage provided by small creeks, the valleys of which seldom exceed six feet in depth. They flow northerly emptying into Carrot river which is not navigable at this point. In low water it can be forded at almost any place. After completing the inspection I returned to Edmonton.

My next work was the inspection of the mounds in contracts No. 35 and 36 of 1912. These contracts are situated northeast of Holmes' Crossing along Athabaska river. Knowing that the trail from Belvedere west would be in a very bad condition and that there was no horse feed in the country I decided that the cheapest and quickest way to get there was to go west on the Grand Trunk Pacific railway to Hinton and then paddle down the Athabaska in canoes. The upper part of the Athabaska is not navigable for steamboats and in low water there is just sufficient for canoes drawing twelve inches of water. The current is very swift and there are many small rapids. The first one hundred and twenty-five miles can be covered in two days, after that thirty to forty miles per day is fair travelling, much depending on the wind and the height of the water. At Holmes' Crossing I engaged teams to take the camp outfit to contract No. 36 and on the following day we started the inspection of the mounds. When this was completed we returned to the Crossing, and going down stream we inspected contract No. 35 from the river. Northwest of Holmes' Crossing along the Assiniboine flats there is a large settlement of people from Dakota. They have but recently gone in there and their progress is somewhat slow as there is but little open country. However, they report that they are not troubled with frost and everything they have tried so far has been successful, particularly garden vegetables; the small patches of grain that they put in have ripened thoroughly. A railway location was surveyed in the winter of 1911 crossing the Athabaska at Holmes' Crossing and heading for Sawridge. From what I could find out it runs parallel to the Calgary and Edmonton railway and about fifty miles west of it. Although I could get no information concerning the road the fact that a survey has been made is a start, and such a good country cannot remain much longer without railway facilities. Having com-



pleted the inspection I continued down the Athabaska in canoes to Athabaska settlement then by train to Edmonton.

In connection with this trip I would like to mention that there is one place west of where the Athabaska crosses the trail to Grande Prairie that is a remarkably good site for power development. The river turns at right angles and enters a narrow gorge about two hundred feet deep and from three hundred to four hundred feet wide; the banks and bottom are sandstone. A dam could be built across and the water held back forming an immense reservoir insuring a uniform supply during the whole year. Gravel for the dam could be had a short distance back from the proposed site. There is no doubt this is a national asset that is worth while looking into and preserving.

My next work was to extend the lots of Lesser Slave Lake settlement to the shore of the lake. Owing to the extremely low water, navigation was late in starting and the large accumulation of freight made it impossible to secure accommodation on the steamboats, so I started overland with my horses and wagons. The road is so bad that it does not pay to travel it after the frost is out, particularly with any kind of a load.

There is a lot of good country yet to be taken up along the south side of Lesser Slave lake in the vicinity of Swan river and west of it. It is equal to the Peace river valley and has the advantage of being close to navigation and to a railway that is almost constructed at this date. An abundant supply of hay can be cut and there is ample rainfall in this district.

My next work was a settlement survey at Wabiskaw lake. There are three routes to reach this place. The first is a winter trail from Athabaska direct to Wabiskaw which follows the frozen lakes and marshes and is impassable in summer. The second goes down the Athabaska to Pelican river, and up that river. By this route I am told there are fourteen portages varying in length from a few hundred yards to three miles, and some of the portages are over muskegs and swamps which are not practical for heavy loads. However all the spring catch of fur that is taken after the roads break up is taken out this way. The fur-dealers of Wabiskaw have their goods brought down to the mouth of Pelican river during summer and stored, then freighted to Wabiskaw by teams during the winter. The third route, which was the one I chose, is a pack trail from the mouth of Martin river on Lesser Slave lake. While waiting for my pack saddles to arrive from Edmonton I started my men opening up this pack-trail into a wagon road. In this way we were able to use wagons for about thirty miles and pack-horses for the remainder of the distance. As I had but eight horses to pack for twelve men I cut the outfit down to one blanket to each man with what clothes he was wearing, using only one tent for the party and taking provisions for ten days. This with the iron posts, instruments and other necessary articles made a maximum load for the horses.

Wabiskaw is situated on the north side of a channel joining two lakes. This channel flows through a marsh which varies in width from one to two miles. When I arrived at the south side of this marsh, which at that time was covered with water from four to six feet deep, I had considerable difficulty in attracting attention but I finally got an Indian who was hunting ducks to take me across in his canoe. I then rented boats to take the men and outfit over and swam the horses, nearly drowning one of them. On the following day, we started work.

The settlers at Wabiskaw are mostly half-breeds and Indians with white people in charge of the three stores and the missions. The total amount of land under cultivation is about seventy-five acres while the total length of wagon road is less than a mile. Upon inquiring into the cause of this backward condition, the fur dealers told me that successful hunters made as much as two thousand five hundred dollars during the season with furs, and that it did not pay them to cultivate land. Labour is worth two and a half dollars and board per day; but two to four days was as long as any person would work at one time; they would then take a holiday. Goods are sold at from five to six hundred per cent higher than in Edmonton. There are three trading posts,



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Church of England and Roman Catholic missions and a monthly service mail from Sawridge by packhorses.

Wabiskaw is located in the centre of an immense saucer-shaped tract of land, and during a wet season all the water drains down into the lake, and as there is but one small outlet the water rises and floods the hay marshes, and does not go down again until November, when it is too late to cut hay. This could be easily remedied as the outlet of the lake is Wabiskaw river, and half a mile from the lake the river is a succession of rapids; all that is necessary is to widen the channel, not to deepen it. By this means the overflow of water would run out, and the depth of the lake would be maintained, thus protecting the fishing industry. This industry is not followed at present, not for lack of fish, but because the freight rates are prohibitive. Such a conditions of affairs will not last for more than a couple of years as a direct communication will then be opened up with the Edmonton and Dunvegan railway at Sawridge.

The land in this vicinity is covered with scrub and scattered poplar from four to eight inches in diameter with a few spruce in places. I saw no timber fit for milling purposes, but was told that there is a sufficient supply for future settlers, though not enough to warrant the erection of a large saw-mill. The only means of cutting it at present is the slow process of whip-sawing. When the land is cleared it will be as productive as any other part of the province. The Roman Catholic mission people are at present raising oats, barley, wheat and all kinds of garden vegetables, all of which ripen. The soil is a clay loam. The first twenty miles along the trail from Wabiskaw to the mouth of Martin river has been burned over, and a farmer could start easily, more particularly if he had a few head of stock. Good water may be had in abundance everywhere.

The survey being completed, I started on my return journey. I swam my horses across the marsh a little west of the mission, then struck south about three miles, again swimming Willow river and heading in a westerly direction through the bush until I reached the trail by which I came in, and finally arrived at the mouth of Martin river on Lesser Slave lake. At this place I started the inspection of contracts Nos. 5 and 9 of 1913. We soon ran out of provisions, however, and had to move to Sawridge. On my arrival there I found that the supplies I had left in the Northern Transportation company's warehouse had been destroyed by the unusual and extreme high water. As it was impossible to purchase supplies there, and as there were three contracts to be inspected along Athabasca river, I left my transport at Sawridge and went to Edmonton by boat and train. I purchased supplies and went by train to Hinton, where I started on a second trip down the Athabasca in canoes. I inspected the three contracts along that river, and followed the river down as far as Mirror Landing, then moved up Lesser Slave river and thence to the west end of Lesser Slave lake, and commenced working eastward. I made use of the canoes on this trip as I knew the high water had flooded the trail around the lake, and that the railway grade which crosses the trail so often would make it almost impossible to use wagons. This trip was successfully made in canoes and the work was completed.

I arrived at Mirror Landing on November 1 to find the Athabasca full of running ice. I found out by telegraph that it was impossible to cross on the ferry at Athabaska, and as the railway company had a scow working at Mirror Landing I made arrangements with them to cross my outfit. This we did by putting one team in the scow at a time and tracking it up half a mile along the shore and then working it across with poles while drifting down. I drove to Edmonton along the new Edmonton and Dunvegan railway line, and on my arrival stored the outfit, placed my horses in winter quarters, and paid off my party.

I have the honour to be, Sir,

Your obedient servant,

G. J. LONERGAN, D.L.S.



## APPENDIX No. 34.

## REPORT OF E. S. MARTINDALE, D.L.S.,

## BASE LINE SURVEYS IN EASTERN SASKATCHEWAN.

AYLMER, Ont., July 31, 1914.

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa, Canada.

SIR,—I have the honour to submit the following general report on my survey operations during the season of 1913-14.

Instructions for the survey of the sixteenth base line from the third meridian to the second were received early in February, 1913. I left for Prince Albert immediately, in order to have the season's supplies cached at suitable places before the winter broke up, and also that I might be able to run the base line across Montreal lake on the ice, thereby avoiding the long and difficult triangulation which would be necessary in the summer. It was found upon making inquiry, that a proposed railway, known as the Hudson's Bay Pacific railway, now abandoned, had been surveyed northeasterly from Prince Albert for a distance of over one hundred and thirty miles. This line crossed the fifteenth base line in range 18, and from there was reported to run almost due north. I arranged to have a cache established in the vicinity of the sixteenth base line on this railway line by making use of the road, cut out at the time of the survey, for freighting in the supplies. My assistant took charge of this work but, because of the excessive depth of snow and the lateness of the season, he succeeded in reaching a point only about two miles north of the fifteenth base line, where the supplies were cached. In the meantime I had organized a small party, and, with a hired transport outfit, left for Montreal lake to carry out the other part of the work which it was advisable to complete before the break up. After arriving at Montreal lake, a trail was cut westward nearly to the meridian, and the survey of the base line was commenced. The snow at this season was very deep and retarded progress to some extent. The line was run to the east side of Montreal lake, a distance of about fourteen miles, by April 5. A cache was built there, and the supplies which had been forwarded by the Hudson's Bay company from Prince Albert to their post at the south end of the lake, were then freighted up the lake and stored; this work was completed by April 9. By that time the snow had practically all disappeared, and travelling with our sleighs was very heavy. Prince Albert was reached on the 13th, and the party paid off the following day. I then proceeded to Ottawa for observing practice, and while there completed my final returns for surveys of 1912.

In the meantime I had been instructed to complete the fifteenth base line by running east from the third meridian to the east boundary of range 22, before again taking up work on the sixteenth base line.

On June 7, 1913, I again left for the West. Horses and transport outfit were collected from Edmonton and Lac la Biche, Alberta, and from Bowsman, Manitoba, and shipped to Prince Albert where the party was organized. On the 26th, the outfit was sent out with teams in charge of the assistant to the "Red Deer Forks" on the Montreal lake road, near our point of commencement, and a pack trail was cut to the third meridian. By June 24 our horses had all arrived at Prince Albert and on the



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following day I left there with the packers, reaching camp July 3. We moved to the meridian and commenced survey work the next day. Four days of almost continuous rain beginning on the 10th flooded the country and made the swamps and muskegs almost impassable for horses.

Our work on the fifteenth base line was completed on September 25. A trail was then opened out from the west side of Candle lake northerly to a lake on the northerly boundary of township 58, range 23, then westerly to the east shore of Montreal lake and thence north along the lake shore to the sixteenth base line where work had been discontinued in the spring. The survey of this base line was then carried on to its completion at the second meridian, the final closing being made on June 20, 1914.

Horse feed along the base line was very scarce and of poor quality, and, after freeze up, hay and oats had to be freighted in from Prince Albert by way of Hudson Bay Pacific trail. Our inability to get in touch with this trail until December, and the failure of freighters to get through with horse feed, caused us to lose considerable valuable time in December and the beginning of January. Practically no snow fell to the south of the fifteenth base line until late in January, and it was difficult to get freighters to venture on long trips with wagons at that time of the year.

Horse toboggans or flat sleighs were used for transportation during the winter months and also in the spring until the frost was practically all out of the muskegs, and they proved most satisfactory for the purpose. Our sleighs were two feet wide, twelve feet long, made of one and a half inch oak and were fitted with shafts. Loads of from five to ten hundred pounds were hauled, depending on the state of the trail and three men had no difficulty in handling the outfit of eight sleighs. In the spring after the snow was gone, the ponies hauled from three to four hundred pounds. Extra heavy canvas should be used for covers in this work and special attention should be given to the lashing of the loads in order to prevent damage to camp outfit and loss of supplies.

The intersection of the sixteenth base line and the second meridian falls in Namew lake and it was necessary to make the closing on the meridian at the northeast corner of section 25, township 60.

The survey being completed, the outfit was loaded on a barge and taken by steamer down through Namew and Cumberland lakes and Saskatchewan river to Pas, where it was shipped via Canadian Northern railway to Prince Albert, reaching there on June 23. The men were paid off, the outfit stored and arrangements were made to pasture the horses for the summer.

*Routes.*

There are two main transportation routes into that portion of the north country lying between the second and third meridians, one following more or less closely each meridian. At the west the Montreal lake road runs northerly from Prince Albert past Shoal Creek headquarters camp of the Prince Albert Lumber company, situated a little north of the fourteenth base line and west of the meridian, and then crosses the fifteenth base in range 1 and the meridian in township 57, thence northeasterly to the small settlement at the south end of Montreal lake. The winter trail then runs north, crossing Montreal lake, to lac La Ronge. From Prince Albert to the Shoal Creek camp the road is in fair condition nearly all year, but north of this it passes through many swamps and muskegs and in consequence used but little in summer. In the winter, however, a large number of teams are employed in freighting the yearly supply of provisions and merchandise for the various trading companies located at Montreal lake, lac La Ronge and Fort Stanley.

Along the second meridian a sleigh road, following rivers and lakes for the most part, runs from Pas to Cumberland House, thence northerly across Cumberland, Amisk and other lakes to Pelican narrows on Pelican lake, from which place the northern freight is distributed by water route in the summer. This road which crosses the



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sixteenth base line in range 2 was opened out from Cumberland lake north in the winter of 1912. In the summer this country can best be reached by water from Pas up Saskatchewan river to Cumberland lake and through Whitey and English narrows to Namew lake. Numerous steamers and gasoline launches are now operating on this route catering to the needs of the prospectors going into the recently-discovered gold fields of Amisk lake, which are reached from Namew lake by means of a newly-cut portage (wagon road) fourteen or sixteen miles in length.

The Hudson Bay Pacific railway trail runs northeasterly from Prince Albert crossing the fourteenth base line in range 21, the fifteenth in range 18 and the sixteenth in range 16. The end of this trail is reported to be about fifteen miles northeasterly from its crossing on the sixteenth base line. This road has practically never been used, except by a few trappers, since it was first cut. Summer travel is difficult on account of swamps and muskegs, while between the fifteenth and sixteenth base lines it follows rough broken and hilly country making winter travelling also heavy. It is joined a few miles north of Torch river by a road from Fort à la Corne.

Another wagon road runs northerly and easterly from Prince Albert to the south end of Torch lake. By this route the country in the vicinity of the fifteenth base line in range 23 may be reached but in summer it is necessary to complete the trip from Torch lake to the base line by water.

*Description of the country adjacent to the fifteenth base-line from range 27 to range 22 west of the second meridian.*

From the third meridian to Bittern lake in range 26 the country varies from rolling hills, covered with small birch, poplar and spruce in the western part of range 27, to low level swamp and muskeg with low jackpine ridges. To the north of the base line, tamarack, swamps and muskegs extend nearly to Montreal lake, while to the south it is more rolling with a few small areas of good spruce. To the south of the base line in range 27 drainage is to the southwest through Spruce river and emptying into the Saskatchewan at Prince Albert, while the water to the north flows through Bittern river and finally into the Churchill. Bittern lake is a long, deep, narrow body of water about twelve square miles in extent, which overflows through Bittern river. It is reported to be well stocked with whitefish and pike. Several small streams flow into the lake, namely, Bittern creek from the west, Wolftrap creek from the south and McLean creek from the east and south. A small tract of good milling spruce is found at the south end of the lake. Bittern river, from one to two chains in width, follows a tortuous route from Bittern lake to the south end of Montreal lake and is not navigable by canoe throughout its whole length because of numerous small shallow rapids. A wagon road has been cut between the two lakes and is used by the Indians from Montreal lake who fish at Bittern lake in the winter. An Indian reserve has been set apart at the south end of Montreal lake; this includes several hundred acres of very good spruce and poplar running from ten to twenty inches in diameter. Located there are the trading posts of the Hudson Bay company, Révillon Frères, and one or two other independent traders, also a small mission day school for the Indian children.

Range 25 is low and wet with the exception of a low poplar ridge crossing the base line and extending for a distance of about three miles on either side of the line. McLean creek, about eight feet in width and from three to six feet in depth, was crossed in section 31 in an open swamp. To the south of the line the country appears to be higher and more rolling and is mostly covered with small jackpine, while to the north it is fairly level consisting of spruce muskegs separated by low jackpine ridges; there are also some large areas of very thick small spruce. Clearsand lake, or as it is sometimes called "West Candle lake", covers an area of about eight square miles and drains to the east into Candle lake. Range 24 is higher and more rolling; it is mostly covered with birch and poplar from three to eight inches in diameter and also



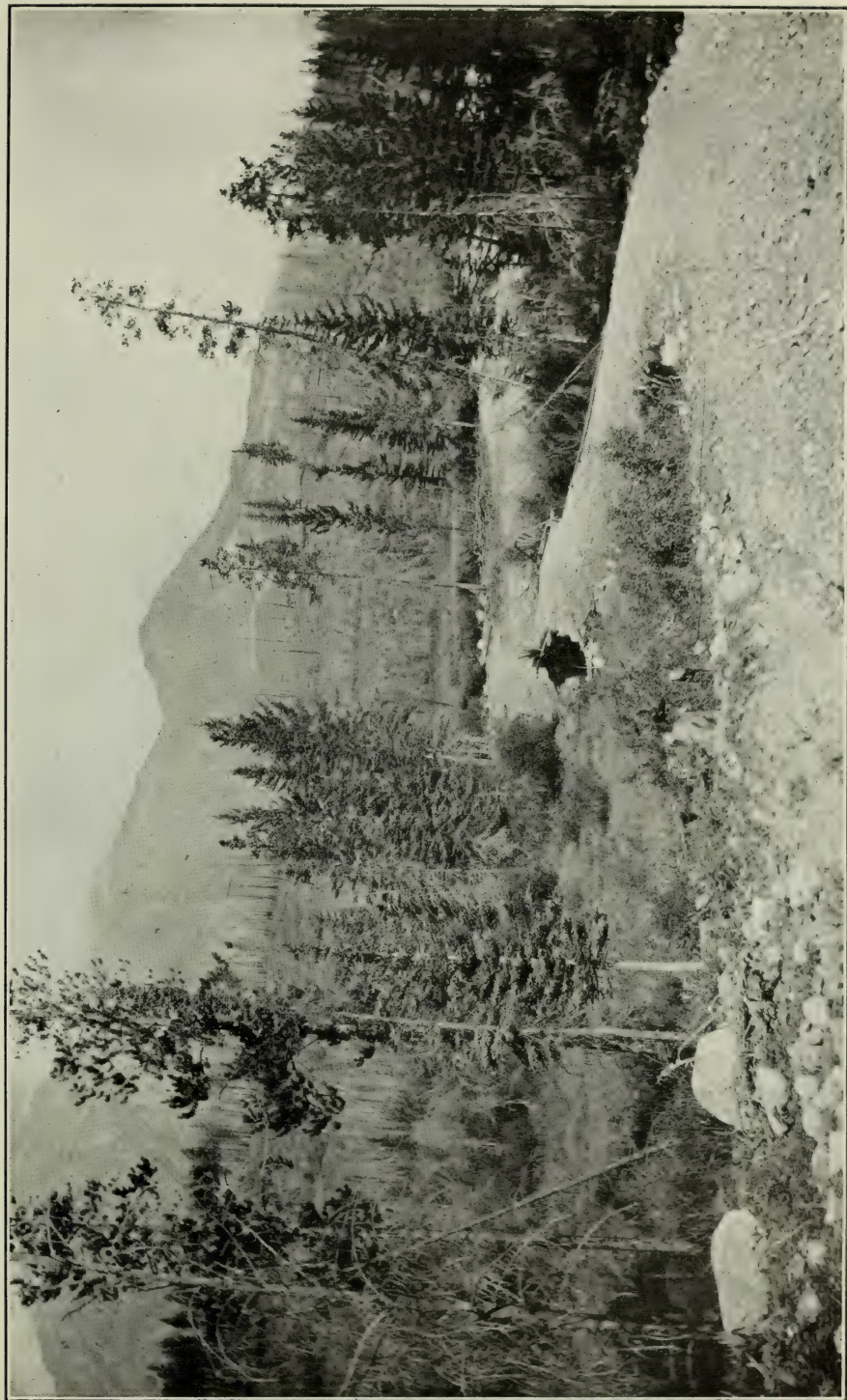


Photo by H. Matheson, D.L.S.

Road to Pyramid Lake in Jasper Park, Alberta.

Pyramid lake is situated in township 45, range 1, west of the Sixth meridian four miles from Jasper. The road from Jasper, which like all other roads in the Park has been built for tourist traffic, is a splendid road for automobiles, and has very easy grades. In the foreground of the picture is the bridge over Cottonwood creek.







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some jackpine up to nine inches in diameter. There is also an area of about one hundred acres, thickly covered with spruce and poplar up to twenty-four inches in diameter, a short distance south of the base line in this range. To the south are jackpine ridges with spruce muskegs and tamarack swamps.

Candle lake was crossed near the north end in range 23. This is a fine body of water covering an area of sixty or seventy square miles. Whitefish and pike are caught but not to the same extent as was the case a few years ago. Torch lake, to the south and west of, and in close proximity to Candle lake, covers eight or ten square miles and drains into the latter through Fisher creek, a deep narrow stream about three miles in length. This lake is surrounded to the northwest and northeast by large hay meadows which, however, are subject to flooding in wet seasons. A considerable area of good milling spruce lies to the south of the northwest portion of Candle lake which, I understand, has already been disposed of as a timber berth. Torch river flows from Torch lake through the southeast arm of Candle lake into Saskatchewan river near Cumberland lake. To the north and east of Candle lake the country rises about 190 feet in crossing range 22. There spruce muskegs alternate with low jackpine ridges. Along the east shore of the lake is a narrow strip of poplar and spruce up to eight inches in diameter.

The soil on the ridges and on the higher ground is a sandy loam throughout, while on the lower lands it is a vegetable muck. There is some good agricultural land in the vicinity of Candle lake and at a few points along the base line, but at present, this country generally, is too wet to be of much value for agricultural purposes.

A farm has been taken up at the mouth of Fisher creek on Candle lake where vegetables such as potatoes and turnips are successfully grown.

*Description of the country adjacent to the sixteenth base line, from the third to the second meridian.*

At the point of commencement of the base line at the third meridian is a tract of good milling spruce from eight to twenty inches in diameter, extending to the east a distance of thirty chains to a branch of Burntwood river. The greater portion of this area appears to lie to the west of the meridian. East to Montreal lake the country is rolling with a descent of approximately one hundred feet in the seven miles from the meridian to the water in the lake. For the most part it is wet and swampy with occasional poplar and jackpine ridges. The western shore of the lake is low, mostly spruce and tamarack muskegs. To the north and west of the base line the land appears to be higher and more rolling. The soil is a vegetable mould varying from two to six inches in depth, underlaid by a sandy subsoil. Burntwood river, which is about a chain in width, is crossed in section 33, range 27, and flows south between steep banks to its junction with Crean creek, thence easterly to Montreal lake. A few small lakes were noticed in this district.

Montreal lake, nearly seven miles in width where it is crossed by the base line, has a length of over thirty-two miles and an area of nearly one hundred and seventy square miles, and is comparatively shallow. Fish are not plentiful and are of poor quality. To the east of Montreal lake the country rises six hundred feet or more to the height of land between the Churchill and the Saskatchewan near the west boundary of range 18.

The east shore of the lake is also swampy to a large extent. There are a few patches of good spruce to the south of the base line not far from the lake. Farther south are also a few small hay meadows. A lake about two miles in extent, is situated in township 59, range 23, and is well stocked with whitefish; to the west of the lake are several hay meadows where hay is put up by the Montreal Lake Indians. There is also some good agricultural land in this vicinity, the surface being rolling and wooded with small poplar and spruce.



In range 24 a strip of good timber two miles wide, and with an area of about ten square miles, was crossed by the base line. The trees which are mostly spruce, jack-pine and poplar, are from eight to twenty inches in diameter and are clean and straight. In ranges 23 and 22 the land is gently rolling, mostly spruce and tamarack muskegs with occasional clumps of small spruce and poplar and low jackpine ridges. An open swamp one and a half miles wide from ten to twelve miles long was crossed in range 23.

In range 21 the country both to the north and south of the line becomes more broken. To the north the surface is broken by deep ravines, and is wooded mostly with small poplar, spruce, birch and jackpine, while to the south are spruce muskegs and jackpine ridges, the latter becoming more prominent and numerous. A series of three large lakes known as the "White Swan" lakes lie to the south of the line in this range. Drainage from these lakes is to the southwest into the lake in township 59, range 23, and thence to Candle lake. The height of land there is but a short distance south of the line and runs approximately east and west. Ranges 20, 19, 18, 17 and part of 16 are from rolling to hilly, being broken by deep ravines running nearly at right angles to the base line, and are covered, generally speaking, with a thick growth of small spruce and jackpine with occasional small areas of birch and poplar four or eight inches in diameter. A few small patches of good spruce were also noticed in these ranges. To the south near the correction line is a well-defined range of sand hills running nearly east and west. It is reported that this broken country extends northwesterly to Pipe-stone lake, a large body of water lying a short distance southeast of lac la Ronge. To the south of the line in ranges 18 and 17 the country has been burned over within recent years. There are numerous small lakes along this part of the line.

From the height of land an elevation of 2,242 feet above sea-level, the country drops rapidly to the east to the large muskegs at the east of range 16 with an elevation of 1,434 feet. The Hudson Bay Pacific railway survey, crossed in section 36, range 16, marks the easterly limit of the higher hilly country. In range 16 there is some poplar and birch averaging eight or ten inches in diameter; the surface both to the southwest and northeast is wooded with jackpine from four to eight inches in diameter.

From Montreal lake to range 16 the soil consists of a layer of vegetable mould underlaid by a loose sandy subsoil except in the hilly country and on the ridges, where it is inclined to be heavier and stony.

From range 16 to range 2 the nature of the country is practically uniform, the greater part being low, apparently level, and wet, with tamarack swamps, spruce muskegs, quaking bogs, occasional low jackpine knolls and ridges and patches of small spruce. The south branch of Mossy river was crossed in range 15. It has an average width of forty feet and joins the main stream some distance farther east. Along the banks of this river are a few large spruce trees. This river which is the main drainage outlet of the district, was crossed at three points on the line, first in range 13 and twice in range 11; it has a width of from two to three chains and on account of numerous small rapids is difficult for navigation even with canoe. Brougham creek, from thirty to fifty feet wide and flowing south to Mossy river was crossed in range 7. To the east of this creek in the same range is another small area of spruce and jackpine of eight to twelve inches in diameter. Lakes in this stretch of country are few in number and are small and marshy. From a point about half a mile south of the second crossing of Mossy river in range 11, an old flat-sleigh trail runs easterly to "Pine bluff" which lies about nine miles up Muskeg river from Cumberland lake. A winter dog trail from "Pine bluff" running north, crosses the line in range 6.

A small Indian reserve has been laid off at "Pine bluff," and outposts of the Hudson's Bay company and Revillon Freres are located there.

A lake in township 62, range 6, is reported to be large and deep and well stocked with fish. Grassberry river was crossed in range 5. This stream varies from one to



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two hundred feet in width and is six feet deep, except at the numerous small rapids where the shallow water makes canoe travel difficult and tedious. It flows south-westerly from a lake about ten miles north of the base line joining Mossy river at "Pine bluff." These waters flow into one of the several channels of the Saskatchewan leading to Cumberland lake.

An old sleigh trail, cut from Cumberland lake to the lake in township 62, range 6, as a means of freighting fish from the latter to Cumberland House many years ago, was crossed in a large quaking bog in range 4. Mackenzie lake, in ranges 4 and 3 south of the line, has an area of about twelve square miles and is almost entirely surrounded by muskgs. It drains into Cumberland lake through a small creek at the southwest corner. According to all reports, it is well stocked with jackfish.

In range 3, along the base line and to the north of it the proportion of dry land to muskeg begins to increase. The surface is gently rolling, and the limestone ridges first noticed in range 6 become more prominent. From the base line south to Cumberland lake there is practically no dry land except near the lake shore. The winter portage from Cumberland lake to Amisk lake is crossed in section 32 range 2. From the base line to Cumberland warehouse on the north shore of the lake, the road runs almost continuously through quaking bogs. Near the lake are some well-defined ridges made up of limestone and granite boulders, evidently carried there and deposited by the ice.

Across ranges 2 and 1 east of O'Leary lake the country is fairly level and dry, being partly covered with jackpine from six to ten inches in diameter. There is also some dry spruce muskeg with tamarack swamps both to the north and south of the line. Several lakes with areas of about five square miles lie in these two ranges and are well stocked with jackfish. The base line closes on the second meridian in Namew lake, a large body of deep water with rocky (limestone) shores. Excellent whitefish and jackfish are caught, and sturgeon fishing was an important industry on this lake a few years ago.

The soil in ranges 1 and 2 is a clay loam which to all appearances is well suited for farming. From range 16 to range 2, however, the soil is mostly a vegetable muck which, if drained and exposed to the sun, would no doubt in time become valuable for agricultural purposes. No hay meadows whatever were seen in the immediate vicinity of the base line throughout its whole length.

No traces of economic minerals were seen. Large game, such as moose, deer and caribou, are plentiful, while elk are frequently seen in the neighbourhood of Torch lake. Bears and the other important fur-bearing animals such as lynx, mink and foxes are frequently seen. Timber wolves were also heard during the winter. Rabbits were unusually plentiful during the winter of 1913-14, but they are commencing to die off. Spruce and birch partridges are common in some localities, and occasional prairie-chickens and ptarmigan were also seen. Wild fowl such as ducks and geese were very scarce at the western end of the line, but were plentiful in the swamps nearer the second meridian.

The summer of 1913 was unusually wet. The winter following was mild, except for a few cold snaps of short duration; snow was not as deep as usual, being about two feet on the level, and it did not come until late in the season. Summer frosts are frequent, as is the case in all the newer parts of the Canadian West, but otherwise the climate is very much the same as it is farther south on the prairies.

I have the honour to be, Sir,

Your obedient servant,

E. S. MARTINDALE, D.L.S.



## APPENDIX No. 35.

## ABSTRACT OF THE REPORT OF H. MATHESON, D.L.S.

## SURVEYS IN THE VICINITY OF JASPER, ALBERTA.

On May 21, 1913, I left Edmonton, Alberta, for Jasper, where I arrived on the morning of the following day. After examining the country and consulting Col. Rogers, Superintendent of Jasper park. I commenced a survey of the townsite on May 23.

At that time the town consisted of only a few scattered shacks situated in the vicinity of the railway station. It was a typical railway construction town. The only permanent buildings were those belonging to the Grand Trunk Pacific Railway company consisting of a station, roundhouse, and some smaller buildings.

These buildings were situated on a flat about half a mile wide and about two miles long, lying along the left or west bank of Athabaska river just below its junction with the Miette. This flat is fairly level and is about sixty feet above the level of the Athabaska river bed. It is bounded on the north and west by a hill which is from two hundred to three hundred feet high and which rises to a rolling plateau broken by small creeks and numerous small lakes. The largest of these lakes are Cabin, Pyramid and Patricia lakes. Cabin creek drains Cabin lake, and runs across Jasper flats; it is used as a source of water supply for the town.

Practically the whole of Jasper flats consists of boulders and gravel. Consequently it has good natural drainage. It is a very suitable location for a townsite, even though excavation for sewerage and waterworks systems is difficult on account of the great number of boulders. Excavation for building foundations is also difficult, but the boulders obtained in the excavation can be used for building purposes, and when properly used greatly enhance the architectural beauty of the buildings. My surveys were considerably retarded by the boulders, as a hole had to be made for every iron post planted to mark the townsite. I do not think that any post could have been driven to its proper depth without striking a boulder.

Jasper flats, except the parts cleared for townsite purposes, are covered with timber consisting mostly of small jackpine and a few large Douglas fir. The fir, on account of their thick bark, have been able to withstand the forest fires which have occasionally swept the country, destroying all the other timber. On the rolling plateau west and north of Jasper there is much *brulé* and dead standing timber, mostly spruce and pine up to two feet in diameter. Some of this is also found on Jasper flats. The Douglas fir is not found much farther east than Jasper, but live specimens as large as four feet in diameter are found in that vicinity. On account of forest fires, very little large green timber of any other variety is found except where it is protected in deep gullies.

The townsite is situated west of the Grand Trunk Pacific railway, adjacent and parallel to the right of way. The railway depot is opposite the centre of the townsite. The avenues are parallel to the railway track and the streets approximately perpendicular to it. It consists of twelve blocks and ten reserves.

I completed my survey of Jasper townsite on June 27, and then moved my outfit into the Brazeau district to complete some work which I had started in 1912. The work to be done lay in townships 47 and 48, ranges 17 and 18, west of the fifth meridian. A Canadian Northern railway location line runs through the district. I surveyed sufficient section lines to tie in the right of way in these townships.

To reach this work I proceeded by train from Jasper to Bickerdike, and thence by the Alberta Coal branch to the Pacific Pass Coal mines (now called "Lovett"). From the mines I travelled northeast for three days by pack train to my first work in township 48, range 17.



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The townships surveyed consist mostly of wide low ridges separated by shallow muskeg. They are thickly timbered with spruce, jackpine and some poplar and willow. Tamarack is found in the muskegs. Most of the large timber has been ruined by fire, and now lies as *brulé*. The difficulty of travelling over this fallen timber was the greatest handicap to the work. The soil is generally a sandy loam with few boulders, and would be very productive if it were cleared, and the muskegs drained. However the general elevation of the district is high, so that it is subject to summer frosts, and it will not likely be used for agricultural purposes for some time. I completed my work in this district on September 9 and then moved my whole outfit back to Jasper.

I found conditions at Jasper considerably changed. Many of the houses were moved on lots in the townsite. Considerable progress had been made in grading the streets and a new administration building was about half completed. This is a handsome building constructed of boulders. A road was also built to Pyramid and Patricia lakes.

My first duty was to traverse the road to the lakes and then to lay out villa lots one hundred feet by one hundred and fifty feet, around the lakes. Pyramid lake is somewhat crescent shaped, and has an area of about three hundred acres. It is drained from the north end by a creek. A number of small creeks run into it through a muskeg on the south side. The southern and eastern shores of the lake consist of muskeg flats and benches up to ten feet in height. On the north and west sides fairly high steep hills rise from the water's edge. There is a small well wooded island in the lake, which is very beautiful. Patricia lake is long, narrow and fairly straight, and has an area of about one hundred and twenty acres; the average width is about nine hundred feet. It has no visible outlet or inlet, and its water has a bitter taste. In some parts steep hills rise from the water's edge, while in other parts of the shore there are benches not more than twenty or thirty feet above the level of the lake.

These lakes will make very fine summer resorts as they are suitable for boating. There is a good choice of lots; they can be had on low benches, high benches or on hillsides of various slopes. The front and back lines of the lots are curves and tangents parallel to the lake shores. Patricia lake is approximately three and a half miles and Pyramid lake four miles from Jasper. The new road from Jasper has an easy grade and is suitable for automobiles.

I completed my survey of villa lots on October 21. I then surveyed four corrals of about one acre each, and one of about two acres, situated behind Jasper townsite near the foot of the hill. The small corrals are to be leased to packers who furnish transportation and act as guides to tourists. The large corral is for the government transportation outfit. The corrals form block "A" of Jasper townsite.

After completing the survey of the corrals, I commenced topographical work, which I did by the transit-stadia method. Closed traverses were run, and from the stations of the traverses numerous side shots were taken to locate the contours. Rough sketches of the country were made. From the traverse notes and sketches regular topographical maps were afterwards constructed. I first traversed Cabin lake and a considerable area around it. I afterwards traversed Miette river for a distance of about four miles, commencing at its mouth; I also traversed both sides of Athabaska river for a distance of about four miles above and below the town, and the chain of lakes on the east side of the river. I ran other traverses to locate contours in the country adjacent to the lakes and rivers. I used the Grand Trunk Pacific Railway bench marks as data for elevations. I checked my elevations obtained by stadia by ties on these bench marks wherever convenient. I also ran a line of levels from one of them to Cabin lake.

On January 6, I had completed all of the work on the flats of Athabaska and Miette rivers, which could be conveniently done from my camp at Jasper. I therefore closed operations and on January 8 arrived in Edmonton, where I disbanded my party.



## APPENDIX No. 36.

## ABSTRACT OF THE REPORT OF C. F. MILES, D.L.S.

## INSPECTION OF CONTRACT SURVEYS AND MISCELLANEOUS SUBDIVISION.

The surveys performed by my party during the past season were distributed over the provinces of Manitoba, Saskatchewan and Alberta.

I arrived at Prince Albert on May 19, 1913 and after organizing my party and purchasing supplies left on the 22nd for Mistatim by the Canadian Northern railway.

My first work consisted of making corrections in townships 45 and 46, ranges 9 and 10, west of the second meridian. Much of this land is burned-over swamp and is not suitable for immediate settlement without drainage. We were engaged on this work until June 21 and on the 23rd left for Dauphin. From there we went to Winnipegosis where we secured a sailing vessel, and left for contract No. 13 of 1912 in townships 34, 35 and 36, ranges 16 and 17, west of the principal meridian. It is a pleasant sail up lake Winnipegosis; the water is not very deep along the route we followed, the main channel for vessels lying more to the west. I was informed that great quantities of whitefish are caught and shipped by rail from Winnipegosis every fall and winter, giving employment to many fishermen and teamsters. Settlements are extending along the west shore of the lake, but as yet only a few settlers are located on the east side. However, now that the country east of the lake has been subdivided, there is a fair promise of it becoming settled. During the inspection of this contract we had a good deal of rain and cloudy weather, so that it was impossible to observe for azimuth, except on the morning of June 6 before our departure for Winnipegosis.

We then returned to Dauphin, arriving there on the evening of the 7th. The country between Winnipegosis and Dauphin appears to be very flat, and owing to frequent rains there was much water on the surface, and the creeks and river were full. We left Dauphin on the morning of July 8, arriving at Edmonton on the following morning.

I had been in communication with the Hudson's Bay company's transport department in order to ascertain the quickest method of reaching McMurray where my next work was located. I was informed that their scow brigade would probably leave Athabaska about July 15, but at Edmonton I learned that it would probably not start until some days later. This delay gave me ample time to secure pasture for my horses. Transport and other articles of our outfit were deposited in the Government storehouse. Necessary supplies having been purchased I started with my party for Athabaska on the 15th. When we arrived I repaired to the Hudson's Bay company's transportation office to make necessary inquiries. There I was informed that twenty-seven scows had to be loaded with about two hundred and fifty tons of freight before they would be ready for departure.

The scows used on the Athabaska are each capable of carrying about nine tons. Each scow is fitted out with four big clumsy-looking cars and one sweep, about thirty feet long and nine inches in diameter at the thickest part, which is manipulated in the stern by the steersman. The scows are fifty feet long and have a beam at the widest part of about thirteen feet. The oars in the scows are not used for propulsion except when it is intended to land, or when some obstruction has to be avoided. The sole motive power is the stream, down which they float day after day, the crews landing only for the preparation and consumption of mid-day meals and for the night.



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We left Athabaska on the afternoon of July 22 and during the first afternoon drifted about six miles camping below Six-Mile island; after that the average was approximately forty miles a day. On the 23rd we passed Calling river where there is a small settlement of half-breeds, comprising four or five families, who live in houses, although retaining the Indian habits and customs of hunting, trapping and fishing. In summer, during the season of navigation, they are employed as boatmen on the different scow brigades, which are owned mostly by fur traders who take their goods down almost to the farthest limit of fresh-water navigation. These scows are rarely ever brought back, the steamboats that run below McMurray being utilized for the return trip as far as McMurray. Above this point the free traders, as distinguished from the Hudson's Bay company, have to bring their furs up to Athabaska in their own scows by tracking, the company declining to carry a free trader's furs in their scows.

In summer the mail is carried by canoe once a month from Athabaska to McMurray, but there are no offices on the river between these two points. In winter it is carried by dog-train via Lac LaBiche settlement to McMurray.

At Calling River settlement there is a general store, fairly well stocked with provisions, dry goods, etc. Mr. Peter Prudens the owner of this store does some farming on a limited scale; he grows sufficient oats for his own use, as well as potatoes, cabbages, turnips, carrots, etc., both for his own use and for sale. He has grown wheat very successfully but there is no market for it. The Dominion Government telegraph line crosses the river here and the right of way is cut out all the way from Athabaska. Most of it is passable for wagons, but the banks of Deep creek cannot be crossed with teams. The telegraph line is said to be opened as far as the nineteenth correction line.

We passed two oil-boring outfits, the first one on the right bank, and the next one on the left bank near Pelican portage. Neither of these outfits have struck oil yet but the one at Pelican rapids has struck a considerable flow of natural gas. The first oil-boring outfit is about eleven miles and the other about three miles above the rapids. There is another outflow of natural gas about twenty miles below Grand rapids, near Buffalo river, on the left bank of the Athabaska; there at the edge of the river the gas exudes, and can be lighted with a match. At Pelican portage just below the rapids there is a settlement of seven or eight families, nearly all half-breeds. From there a winter road leads to Wabiskaw Lake settlement. Goods are brought down from the Athabaska by steamer in summer and when winter sets in are freighted across the portage with sleighs to Wabiskaw, a distance of about seventy miles.

Forty-one miles below Pelican rapids is the mouth of House river, which is as far as the Hudson's Bay company's steamer *Athabaska* runs. A quantity of freight is usually taken there by the steamer when the water is fairly high and is then freighted by team over the trail to McMurray. This trail was at one time an Indian pack-trail, but recently it was opened out as a sleigh road. The Hudson's Bay company have at House river a large shed covered with tar paper and there are in the vicinity three or four half-breed families engaged in hunting and trapping. The soil there has not been cultivated to any extent, although potatoes have been grown successfully.

Nine miles below House river the Grand rapids commence. These are very formidable rapids, having a fall of about fifty feet in half a mile. An island lies in the rapids, and by far the greater body of water passes down on the west side of the island. The channel on the east side is not more than three chains wide. The loaded scows are all tied up about a mile above the island whence they are run down singly between big boulders and rocks, to the head of the island, where there is a tramway laid up to near the water's edge. The freight is then loaded on a car and pushed down to the foot of the island, while the empty scows are run down the east channel to some comparatively still water which lies behind a point of land jutting out from the east immediately below the island. At the foot of the island floats in the shape of logs, are attached to the end of a long rope and thrown into the water. They float down through part of the turbulent water into the eddy behind the point jutting out from the east, where



they are taken aboard a scow, which is allowed to float out into the current. Fifty or more hands then take hold of the rope, now attached to the scow, and pull her up to some bare rocks jutting out from the lower end of the island where she is again loaded with freight. This work does not occupy as much time as one might imagine, but every parcel of goods has to be carried on a man's back from the tramcar to the scow, a distance of two or three chains. Merchandise and provisions are as a rule done up in fair-sized packages, but there are other articles, such as stoves which are of considerably greater weight; they have also to be carried on the backs of the men, some of whom may be seen running down the incline with three, four or even up to five hundred pounds of flour on their backs. It is not a smooth path either, as the men have to step from stone to stone and rock to rock.

All of the twenty-eight scows were reloaded by the afternoon of August 2, when we continued our journey down stream. The banks of the river appeared to increase in height as we proceeded down the river, and at a point not far from McMurray the aneroid reading showed the depth of the valley to be over 500 feet. After passing all the remaining rapids, of which the Cascade is the most formidable, we arrived at McMurray, on the morning of August 5.

From this place I proceeded to the inspection of Mr. Tremblay's contract No. 33 of 1912. I hired two canoes and left McMurray in the afternoon and after tracking, poling and paddling up a very rapid current arrived at our destination seven miles up Clearwater river. We camped on the twenty-third base line where it intersects the Clearwater in section 36, township 88, range 9, west of the fourth meridian.

The immediate banks of the Athabaska at McMurray and for some distance up are not very high. The settlement lies on a plateau about forty feet above the level of the river and extends easterly for several miles. There are four stores at McMurray proper, besides a Roman Catholic mission; about two miles farther east there is another store or two. At this place which is called "The Prairie," there are a number of settlers, carrying on farming on a small scale. Up the Clearwater there are also a number of squatters, most of whom appear to be there for speculative purposes rather than with the intention of becoming permanent settlers. The proposed construction of a railway from Edmonton to McMurray in the immediate future, appears to have created a considerable demand for land in that district.

We concluded our inspection of this contract on August 10, and returned to McMurray that evening. On the following morning the scow brigade, now reduced to eight boats, started up stream. Six of these were laden with fur, brought up from the Hudson Bay company's most northerly stations. The other two were cook-scows, one for supplying meals to the passengers, and one for the crew. Each scow was pulled up stream by a crew of ten or twelve men who tramped along the edge of the water. At the "Cascade" all the scows were unloaded as the water was considerably lower, and all the goods, principally bales of fur, and the passengers' baggage were portaged a short distance up the shore while the scows were hauled up by the combined crews. This occupied nearly a whole day.

After passing Cascade, Crooked, Middle and Brulé rapids we finally reached the foot of Grand rapids, the last and also the most formidable of all, on August 20. Here we were delayed until the 23rd, on account of all the cargoes having to be portaged about a quarter of a mile and the scows tracked up stream with a crew of fifty men each. Above the rapids we met the Hudson's Bay company's steamer *Athabaska* in which both crews and passengers, amounting to a total of between 200 and 250 persons, were taken to Athabaska where we arrived about noon on August 25.

After re-organizing my party we again left Athabaska on September 13 via Athabaska river for LaBiche river where we arrived the following day. There is a good pack trail from the mouth of LaBiche river to Lac LaBiche settlement; in fact it has the appearance of having at one time been utilized as a wagon or sleigh road. We packed along this trail about five miles, where we camped, and from there completed



## SESSIONAL PAPER No. 25b

the subdivision of that part of township 70, range 18, west of the fourth meridian, lying south of LaBiche river. On September 29 I received instructions to subdivide township 73, range 19, west of the fourth meridian, I therefore sent my packers with the horses to a point near the nineteenth base line. We broke up camp the following morning, and started down the river with our scow, arriving at the nineteenth base line pack trail on the morning of October 1, the horses having arrived on the opposite shore the night before. We swam the horses across, built a stage for a cache, unloaded the scow, and got everything ready to move into the work. The next morning we moved to the southwest quarter of section 2, township 73, range 19 and commenced subdivision. On the night of the 3rd and the two following days there were flurries of snow which lodged in the trees, and made it somewhat disagreeable for the line men. On the 8th as the work was progressing favourably I started for Athabaska to lay in a further supply of provisions and to purchase some sleighs, which I knew would be required later on. We tracked up the river with a borrowed canoe, arriving at Athabaska on the 11th. I had to purchase another scow and a canoe to carry the provisions, sleighs, harness, etc., back to camp. We left Athabaska on the 18th arriving at my cache, near the nineteenth base line on the 23rd.

The party returning to camp from their day's work crossed a lake on the ice on the evening of the 25th. On the 26th snow fell all night and continued all the following day, so I sent all the party down to the river cache, to haul up the scows and secure them for the winter.

We continued the subdivision of township 73, range 19 and completed it on December 5. This township is fairly level and there is some good soil, but the larger part of it consists of swamps. Very little of the land, west of Athabaska river and below Calling river, will be available for settlement, until either a road or a railway has been constructed on that side of the river. The banks are so high, that it is almost impossible to construct a wagon or even a sleigh road from the river to the plateau above. For this reason the small areas of excellent timber which grow all along the plateau, can not be utilized at present. Judging by the signs and tracks in the snow there is game in abundance, but while we were engaged in the subdivision, four large timber wolves appeared and this had the effect of driving all the deer away. Up to November 21 the lowest temperature was 2° above zero, but on the following morning it dropped to 5° below.

On December 11 we left for the inspection of contract No. 15 of 1913 in townships 70 and 72, ranges 18 and 19, and reached there on the 15th. We completed this inspection on the 23rd and left for Athabaska on the following morning. On our way to Calling River settlement, we passed Mr. Kraemer's fox farm, on the east side of the Athabaska. He had in captivity twenty-seven wild foxes, varying from common red, to cross and silver grey, some of them quite valuable. Owing to my horses not being shod, we could not take the outfit up the Athabaska on the ice, so we had to make a detour by way of Calling lake and thence south, striking the river about twelve miles below Athabaska which we reached on December 27.

While there I purchased supplies and horse feed, engaged a freighter to carry my goods to Moose portage and had my horses rough shod for travelling on the ice.

We left Athabaska on January 2, 1914, for contract No. 14 of 1913, which we inspected and then proceeded to contracts Nos. 13, 12 and 11 of 1913, completing this work on February 18. These four contracts lay in townships 69 to 73, ranges 23 to 27, west of the fourth meridian and range 1, west of the fifth meridian. While engaged on this inspection we experienced the coldest weather of the winter, the thermometer registering 51° below zero for three days. Port Cornwall which was formerly known as Mirror Landing is a new town consisting of several hundred inhabitants situated at the junction of Lesser Slave and Athabaska rivers, in township 71, range 1, west of the fifth meridian. It has a number of stores and a telegraph office, and is on the direct road from Athabaska to Grouard. It lies opposite Smith, a still newer town consisting



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mostly of log buildings, on the south side of the river. This is the present terminus of the Edmonton, Dunvegan and British Columbia railway and is the point where the new railway bridge crosses the Athabaska, said to be 131 miles from Edmonton. This town appears to be the headquarters of the railway company and will be a divisional point. Trains are running on this road to Edmonton every alternate day, but only freight is hauled. Much of the freight so far comes up the river from Athabaska to Port Cornwall, thence to Grouard by way of Lesser Slave lake and on to Peace River Crossing. Sleighs and automobiles are met frequently on this trail. Nearly all the settlers along the river keep stopping-places for man and beast, and they are frequently overcrowded. Much of the country fronting on the river is burned over, the banks on both sides being considerably lower than those below Calling river. There is a fairly large settlement back of Moose portage. The soil is productive and some good crops have been grown, as well as vegetables of excellent quality. Most of the settlers combine with their farming operations, freighting, fishing, hunting, trapping and taking out railway ties, and fuel for steamboats.

We arrived back at Athabaska on February 20. After procuring further supplies and horse feed we again started down the river on the 25th for contracts Nos. 16 and 17 of 1913, both lying along the river below the nineteenth base. We reached there on March 2, and camped on section 4, township 74, range 18, west of the fourth meridian.

The valley of the river in this vicinity varies from 400 to 500 feet in depth, and the banks are generally steep. The plateau above is nearly level, and consists mostly of swamp lands, wooded with spruce and tamarack. The higher areas are covered with poplar and spruce. Small areas of very good timber are found, more particularly in the northern plateau. This will not be available for manufacturing purposes until railways are constructed to carry off the manufactured product.

Athabaska river was in excellent condition for travel at this season, freighting teams carrying loads of three tons and over. A great deal of traffic was carried on from Athabaska to Pelican portage, a distance of about 120 miles, thence to Wabiskaw, about 70 miles, and also from Athabaska to Old House, and thence overland to McMurray. This traffic affords the settlers around Athabaska a good opportunity for employment for their horses during a few months of the winter. Much of this traffic will cease as soon as the Edmonton-McMurray railway is constructed.

Access to any of the lands subdivided down the river from Athabaska can only be had by the river, which is the main highway at the present time for entering these new townships. Those subdivided up the river may be conveniently reached by the newly constructed Edmonton, Dunvegan and British Columbia railway.



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## APPENDIX No. 37.

## ABSTRACT OF THE REPORT OF J. B. McFARLANE, D.L.S.

## BASE LINE SURVEYS IN NORTHERN ALBERTA.

My work during the past season consisted of the survey of parts of the twenty-fourth and twenty-fifth base lines west of the fourth meridian.

I left Toronto on April 3, 1913, but as the ice on the Athabaska was a little later than usual in breaking up, I did not leave Edmonton until the 23rd. This early start was of little avail, as the water was very low and the trip to McMurray in scows a very laborious one. It took twice as long as the same trip the previous year. Few outfits went through without all of their boats suffering more or less damage, and some had the misfortune to have scows sunk. At Grand rapids only a small portion of a scow load could be taken through the last mile and landed at the portage. Consequently we had to make many trips. Below the rapids the water was so shallow that the scows were continually grating on rocks or gravel, and we had to leave one load behind to be brought down at high water, as we had not enough men to handle the scows quickly enough in the continuous rapids. At the Boiler rapids our steersmen successfully used a new channel. At the Little Cascades each scow stuck at the drop and had to be partially unloaded. At the Cascades two-thirds of each load had to be portaged about twenty chains and lowered thirty feet over an ice cliff into the scows and even then the scows stuck at the drop, which was about six feet.

We reached McMurray on May 14, and my horses, which had left Edmonton on April 14, arrived the following day. On the 16th we camped at the mouth of Steepbank river. As practically all the country between there and the end of the twenty-fourth base line in the middle of range 6 was muskeg, we followed Steepbank river. This led us a long distance south of the base line, but as we were sure of running into no impassable muskegs, I decided that this was the quickest way to take the outfit. At the forks of the river we followed the north branch, which took us within a few miles of the end of the line. On June 5 work was commenced on the line by retracing the north boundary of section 34, township 92, range 6.

The country through which the twenty-fourth base line was run this year was about 90 per cent muskeg. A few sand ridges run north and south across the line in the west half of range 6. These mostly face the west and have most of their fall in that direction. This half range and range 7 are drained to the south by the north branch of Steepbank river and its tributary creeks.

This country is, as a rule, flat with a few low sandy or gravelly ridges. Those running north and south have their fall to the west and others scarcely rise out of the muskeg. In the summer of 1912 a fire completely overran the northeastern part of this district crossing the line from the centre of range 7 easterly. As that was a dry summer the moss in the muskegs burned well and all trees except those in the very wet tamarack swamps, were killed. The timber throughout this stretch of country was small and stunted except on the scattered ridges, where patches of good spruce, jackpine and poplar timber were destroyed.

Immediately following fires in this country the grass springs up in the burnt muskegs, and I have no doubt that if the fires were frequent enough to keep the moss and trees from growing, a good ranching country would be formed. Old patches of *brulé* testify that grass will grow luxuriantly on the burnt muskegs until smothered out again by the growing scrub.



Township 93, range 8 and almost all of township 92, up to the high banks of Steepbank river, are drained to the north away from the river, and many creeks rising in this district flow north or northwest to join Muskeg river. Throughout this district the timber, mostly spruce, is thick and small, probably large enough for pulpwood, but not suitable for timber except in narrow bands along some short slopes, or along creeks where the banks have sufficient drainage to allow the timber to grow.

Range 9 is crossed in a west by northwesterly direction by the deep valley of Steepbank river with the river itself coming near the line at the west of the range, but not touching it. The river valley is generally one-half to three-quarters of a mile in width with high banks and steep slopes, and the more level portions are generally well timbered with spruce. The valley is much the same from the mouth of the river bank to the forks of the north and east branches, only its depth and width gradually decrease and the timber becomes more broken with patches of small poplar and jackpine. The north branch soon loses its valley and its banks become gradually lower until they form part of the muskeg. There is very little timber along this branch.

In range 10 the Athabaska crosses the line in section 35. This great river averages about half a mile in width in this vicinity, and is always navigable for steamboats past this point. Its flow at high and at low water differs immensely and an estimate of the one without the other would be very misleading. The channel is always well defined and scarcely ever is any land flooded. Patches of spruce timber up to three feet in diameter are scattered along its banks, and a small but valuable limit, easily accessible, could be had on the flats just north of the mouth of Steepbank river. The river flats are generally about a mile wide with the river sometimes on one side of the valley and sometimes on the other. Many of these flats have large lagoons or lakes with marshes or swamps around them and only a narrow neck of dry ground separating them from the river. At La Saline, about three miles north of the line, a very large hay meadow adjoins a small lake and at several other places there are smaller ones. Last summer however, was so wet that very little hay could be put up as most of the meadows in the north country were flooded.

The banks of the Athabaska valley are about two hundred feet high in this district and in some places are quite steep. There are a number of projections of limestone along the valley and in the river banks, in the vicinity of the twenty-fourth base.

Above the hill, west of the river, there is a stretch of wet tamarack muskeg reaching a long distance to the south and three or four miles to the north. Its width at the line was ninety chains, with only one small jackpine ridge in the middle. A trail was not made across this muskeg but the line was finished, as far as instructions called for, from a flying camp in the next range. A small river known locally as Beaver river, flows almost due north along the east side of range 11, having its source northwest of McMurray and emptying into the Athabaska about a mile below Muskeg river. The valley is about thirty feet deep and less than a quarter of a mile wide with a few chains of flats. Across the remainder of this range the line followed close to a creek with poplar and spruce timber averaging ten inches in diameter along its banks. Back from the creeks, which only drain the land for a short distance on either side, much of the land is muskeg with stunted spruce or tamarack. An old Indian trail for pack-horses crosses the line just west of Beaver river. It runs from McKay to McMurray, following the Beaver almost to its source, thence southeast to McMurray.

Levels were run along the line starting at the last bench-mark established in 1912. Bench-marks were established, as nearly as possible, at every half mile and check levels were run in the opposite direction between these. The elevation which starts at 2,010 feet drops gradually but almost continuously for twenty-one miles till it is 1,100 feet just above the banks of the valley of Athabaska river. The valley is a little less than two hundred feet deep the left bank being the higher. Then the elevation remains about the same until Beaver river is crossed whence there is a gradual rise to 1,292 feet at the end of the line.



## SESSIONAL PAPER No. 25b

On August 5 the twenty-fourth base line was completed through range 11 which was as far as instructions called for. The move to the twenty-fifth base line was then commenced. On the way down the Athabaska we stopped at La Saline for five days and put up hay, as it was impossible to get any one at McMurray to do this for us, although promises were easily obtained. A party of five men with fourteen horses and a scow load of supplies had left the twenty-fourth base line on July 10 to cut trail and pack supplies along the twenty-fifth base. After building a cache on the Athabaska in the vicinity of the latter base we followed their trail and overtook them on August 25 about the middle of range 6. This far the trail had followed close to the line but there we had to swing to the south around a large muskeg basin and follow along some ridges which form a watershed but which are completely covered by muskeg, thence east to Firebag river and thence northeast through a range of jackpine hills. We reached our most easterly camp on the twenty-fifth base on September 8 and on the following day the east boundary of section 36, township 96, range 1, was retraced and the corners moved 4.34 chains north.

The pack trail from the Athabaska was built with great difficulty and travelled with more difficulty and almost all of the party got wet at one time or another by a horse going through or off the corduroy. Fortunately this country was frozen up fairly solid before the line was run through it.

In range 1 the base line runs mostly through sand hills and the two townships to the north are much the same. These townships were completely overrun by fire in 1912. Firebag river, which at this point is about seventy feet wide, three feet deep, and has a current of about one mile per hour, crosses the line in section 34 running northwesterly and then back again in section 33. From there it takes a sweep to the south and winds through a large muskeg which is too wet to have timber of any size on it. In range 2, townships 96 and 97, are both crossed east and west by ranges of sand hills with a wide stretch of muskeg and long stretches of tamarack swamp between them and directly along the line. Firebag river leaves the large muskeg about the middle of the range and swings around south of the hills in township 96. It runs in a small valley through low sand ridges. Range 3 is much the same as range 2 with muskeg along the line and sand hills to the north and also along Firebag river to the south. This river runs in a west by northwesterly direction until it is about a mile and a half south of the line at the west boundary of the range. Near the middle of township 96, range 3, it is joined by a large tributary from the south. It crosses range 4 in a west by northwesterly direction in section 33. Its width is about one hundred and forty feet, its depth two feet and it has a current of about one and a half miles per hour. The muskeg to the east follows the line to the river. The country to the south of the river is rolling and sandy with small muskegs sloping off to a large muskeg basin to the southwest. This muskeg includes the central and western part of township 96, range 4, all of township 96, range 5, and the northeast half of township 96, range 6. It is drained to the north by creeks running into Firebag river. In township 95, across these ranges, is a wide shallow depression draining to the east and to the west. North of the line Firebag river winds in a west by northwesterly direction through a narrow valley with many cut banks. A range of jackpine hills follows the north bank of the river and back of these the country is rolling with creeks or muskegs in the valleys. The greater part of range 7 is dry country. A range of rolling hills covers the eastern part of township 96, range 7. These hills become higher and rougher north of the line and widening out in range 6 and to the west side of range 7, extend north to Firebag river which turns more to the north in this range being joined by the north branch near the north boundary of township 98, range 7.

Much of this hilly country was overrun about three years ago by a fire which killed a large quantity of good spruce timber. The soil on the rougher hills to the north is mostly sand but in the vicinity of the line there was a fair coating of loam and



in many places grass stood three feet high among the fire killed timber. Grass springs up quickly in the burnt muskegs and I think a large proportion of this district could easily be turned into a good ranching country.

The main branch of Muskeg river flows out of Muskeg lake which is about three miles long and a mile wide, and is located about the northeast corner of township 95, range 8. This lake is fed by a large creek from the east. The river is very crooked and from the lake flows northeasterly between dry banks in a rolling country until it nears the base line. There it turns northwesterly amidst the beginning of the large stretch of muskeg from which it derives its name. Where it crosses the base line in section 35, range 8, it is twenty-one feet wide, eight feet deep and flows one-eighth of a mile per hour. At its most northerly part it is joined by the north branch, and from there flows southwesterly across the line and keeps about the same direction to its mouth. It has very little current and is almost dead water except when flooded by rains; it then fills its low banks which are all muskeg and show nothing but vegetable formation below. The water in Muskeg river is always dark coloured and is rather stagnant in winter. Water in the small lakes also becomes stagnant in the winter but all the running creeks had good water. A continuous wide stretch of muskeg follows Muskeg river from the jackpine hills along the Athabaska northeasterly to the source of the north branch. Between the two crossings of the river the line traverses a tamarack and willow swamp.

A range of rolling hills stretches along the line from section 35, range 9, to section 32, range 10. These are covered with thick jackpine, poplar, spruce and birch averaging about ten inches in diameter. In range 9, most of these hills were overrun by a fire in the summer of 1912, which was very dry. This fire burned across the muskeg at Muskeg river and ran off towards the southeast to the twenty-fourth base line. The hills drop down to a lower level about three miles north of the base line and a low stretch of land drains towards the north branch of Muskeg river.

The Athabaska crosses this base line in section 36, range 11, running almost due north. Through townships 95 and 96 jackpine and poplar hills follow the east bank of the river. These gradually drop into muskeg about one mile south of the line. This is the point where our trail leaves the river and where we placed our cache. The river banks are about one hundred feet high and are steep. They are usually close to the channel and have but little valuable timber on them.

In ranges 11 and 12 the line ran through an undulating country covered with thick jackpine, poplar, spruce and tamarack averaging about eight inches in diameter. The country, back from the rivers and creeks is cut up by muskegs, and the creeks in some places spread out in large willow flats.

Calumet river drains the townships north of the line and Tar river those immediately to the south. Both are short streams rising in Birch mountains. This range of mountains will apparently cross the base line about half way between the west boundary of range 12 and Moose lake. They run in a northeasterly direction.

A strip of good spruce timber about twenty chains wide, with the trees averaging from fourteen to twenty inches in diameter, extends along the narrow valley of Tar river across these ranges.

A sleigh trail was cut from the Athabaska to section 35, range 12; this crosses several muskegs but probably a good pack trail could be made following Tar river which crosses the line in section 31, range 12.

Scarcely any of this country would be suitable for agriculture on account of summer frosts and the difficulty of draining and clearing it, but I think a good deal would be suitable for ranching if cleared enough to give the grass a chance to grow.

Rainfall was plentiful throughout the whole season and the snow was about fourteen inches deep on January 15, 1914. No land is flooded by creeks but the muskegs are well filled by heavy rains.



## SESSIONAL PAPER No. 25b

Mineral claims are numerous along the river but the only minerals much in evidence yet are salt and tar sand or asphalt. These appear to be well distributed. Wood fuel is everywhere plentiful. Game and fur-bearing animals are plentiful, and hunting and trapping is largely carried on among the Indians in this district. An industrious and capable trapper can make from one thousand to twenty-five hundred dollars in a season.

No valuable water-powers were found this season. Dams could be built but it would be difficult to get much head. No stone-quarries are opened up and no other industries are started yet although there has been considerable drilling for oil along the Athabaska.

Levels were run along the line and bench-marks established wherever possible near each half mile post and check levels were run in the opposite direction between them. From the elevation of 1,871 feet at the fourth meridian the fall is rapid, to 1,713 feet at the west crossing of Firebag river in section 33, range 1. A hill just west of the river rises to 1,773 feet. From there to the west side of range 3 there is little change in elevation. In range 4 the elevation drops steadily to 1,539 feet at Firebag river. This elevation is again reached three miles west of the river and the elevation then drops steadily to 1,344 feet at the middle of range 6. The hills at the east of range 7 reach an elevation of 1,405, but they slope rapidly to the west. At the crossing of the east branch of Muskeg river the elevation is 1,142 feet and at the crossing of the main river 1,090. Across range 9 the line follows through rolling country draining to the southeast. An elevation of 1,304 feet is reached on section 35, range 10 and from there the slope is towards the Athabaska the elevation of which was 897 feet. West of the Athabaska the land rises gradually to the Birch mountains, with only small local depressions; at the west of range 12 the elevation is 1,818 feet.

On January 15 the twenty-fifth base line was completed through range 12 and as no hay or feed was procurable at McMurray or farther north to continue the survey of the twenty-sixth base line, I decided to close operations for the season. It took four days travel to reach McMurray. We left there on January 21 and in six days and a half we reached the portage to House river. This is a new trail and is still rough. Hay was scarce at McMurray and on the trail as the Hudson's Bay company were holding all they could get in order to do their own freighting. Our horses were on short rations of hay and a moderate amount of oats until we reached Colin river where hay was plentiful. We reached Athabaska on February 5 and Edmonton the following evening.



## APPENDIX No. 38.

## REPORT OF R. B. MCKAY, D.L.S.

## SURVEYS IN THE RAILWAY BELT, BRITISH COLUMBIA.

VANCOUVER, B.C. February 11, 1914.

E. DEVILLE, Esq., L.L.D.,  
Surveyor General,  
Ottawa, Canada.

SIR,—I have the honour to submit the following general report on my survey operations for the season of 1913.

My first work which was commenced on May 17 consisted of the survey of two small parcels of land withdrawn from timber berth No. 553 in sections 30 and 32 of township 17 east of the coast meridian, which had been squatted upon and partly cleared. The land in this vicinity is rather hilly, and is timbered with fir, cedar, hemlock, alder and maple. The soil is well suited for growing fruit and vegetables. A saw-mill was being constructed preparatory to logging the timber of the locality during the following winter. These parcels are situated about three miles from Mission Junction, a town on the Canadian Pacific railway, with a population of about 1,200. It serves as a local market for the produce of the settlers who are engaged in fruit growing, dairying and mixed farming. Fruit growing is the main industry, and the district is noted for the success it has attained in this line.

On May 23 I proceeded to township 21, east of the coast meridian, to establish the east boundary of the western tier of sections in this township, and complete the survey of these sections. The eastern halves of these sections occupy the westerly slope of a steep mountain ridge covered with fir, hemlock, cedar and alder, mostly second growth, interspersed with some large burnt fir. The land for the most part is rocky and unfit for agricultural purposes. There is some good land suitable for fruit or vegetables in the westerly half of sections 19, 30 and 31, but the remainder of the township is mountainous and of no agricultural value.

On June 27 I moved camp to Coquitlam to make a preliminary survey of a proposed subdivision of land withdrawn from timber berths Nos. 77 and 86 in sections 11, 12 and 14 of township 39, west of the coast meridian. This land has been "logged." The soil is a sandy loam, gravelly in places, with gravel subsoil. It is suitable for poultry ranching and fruit land, and where not gravelly for vegetables. It should also make good home sites, as it is situated about two miles from Westminster Junction on the Coquitlam pipe line road and adjoins the limits of the growing town of Port Coquitlam which has recently experienced a boom due to the Canadian Pacific Railway company establishing railway shops and yards there. This town extends to Pitt river where dredging operations are in progress. The ship-building industry has been started and the erection of grain elevators is contemplated.

On July 22 I moved to Port Moody and thence across Burrard inlet to "Sunnyside," where I examined a parcel of land which has been withdrawn from timber berth No. 52, in sections 20, 21 and 16 of township 39, west of the coast meridian and which it is proposed to subdivide into twenty acre blocks. This land is situated about 600 feet above Burrard inlet and is reached by the old Buntzen lake trail, or skid road, which connects with the Port Moody road on the north shore of the inlet where a gravel plant is in operation. The soil is light, sandy loam, rather rocky or gravelly in places and is suitable for poultry ranching, fruit growing and gardening and should make good





**Drainage Operations West of Grand Rapids, Manitoba.**

One man goes along each side of the ditch, which is usually about eight feet wide, and cuts the moss with an ordinary hay-knife. A third man cuts the moss across into strips and then into squares, each about eighteen inches or two feet. Four men follow with iron hoes and lift the squares of moss out on the bank, and three men with shovels level the bottom of the ditch roughly to grade. The rush of water carries away all loose muck left in the ditch.



Photos. by T. H. Plunkett, D.L.S.







## SESSIONAL PAPER No. 25b

home sites for the people of Port Moody where lumbering and oil refining are at present the main industries.

I finished my preliminary survey at Port Moody on August 8, and after increasing my party, proceeded to Columbia valley, establishing camp in section 7 of township 22, east of the coast meridian. From this camp I made surveys of eighteen parcels of land withdrawn from timber berth No. 55 and situated in section 1 of township 19, and sections 4, 5, 6, 7, 8, 9, 15 and 16 of township 22. These parcels were from twenty to eighty acres in area, and were laid out as legal subdivisions or aliquot parts thereof, in such a way as to include the improvements of the squatters on the land. Some of these squatters were attracted to this locality over twenty years ago and although the land has not been open for entry, as it was included in a timber berth, they have remained on their holdings and have annually grown good crops of vegetables and fruit. The climate is mild and rather wet, and the soil is very fertile in many places. When the timber is removed and the land thrown open for settlement, the remaining land in the valley will be quickly taken up. There is a dense growth of large fir and cedar in parts of sections 6, 5, 4 and 9, estimated as high as 150,000 feet per acre, but elsewhere the larger trees are more scattered. The amount of merchantable timber is annually growing less as much of it is decaying and should have been logged years ago. The nearest market for the produce of the district is the town of Chilliwack, fifteen miles distant, which is reached by a road which skirts the eastern shore of Cultus lake.

On September 14 I moved up to the north end of Cultus lake, where I surveyed three parcels in sections 35 and 36 of township 22, east of the coast meridian, and two parcels in section 30 of township 25, all of which were being withdrawn from timber berth No. 55. Here also a good portion of the land will make first class fruit land when cleared. The soil is rich and suitable for garden products of all kinds.

On September 23 I moved camp up Chilliwack river to the end of the Mt. Baker wagon road, in section 34 of township 1, range 29, west of the sixth meridian. There I surveyed three parcels in sections 33, 34 and 27 of this township, and one parcel in sections 32 and 33 of township 1, range 28, all of which were being withdrawn from timber berth No. 50. There are few patches of land in the valley of Chilliwack river in this vicinity which are level enough to be of use for agricultural purposes. The soil is rich and consists usually of clay loam with clay subsoil, and is suitable for all kinds of garden products. The timber is the main resource of the district, large fir and cedar up to four feet in diameter being found on both sides of the river and particularly on the higher benches.

On October 4 I moved to Majuba hill and camped in section 29 of township 22, east of the coast meridian. From this base I surveyed one parcel in section 12 of township 19, and seven parcels in sections 20, 29, 28 and 34 of township 22. This district is easy of access, as it is served by a good road and also by the British Columbia Electric railway. Fruit raising, dairying and mixed farming are engaged in by the settlers. I completed the survey of these parcels on October 25.

I then retraced the east and north boundaries of section 27, township 23, east of the coast meridian, and the northerly boundary of Commonage Indian reserve in that section, and traversed the islands of Fraser river in sections 9, 10, and 15 of township 3, range 30, west of the sixth meridian. Some years ago the channel of Fraser river in these sections was along the left bank, but it has now shifted to its right bank, with the result that the large islands which originally existed have been practically reduced to sand bars and the former channel of the Fraser is occupied by recent deposits of gravel, sand and silt. I also made some traverses in section 4 of this township. Fraser river is navigable through these sections only in high water.

I left this district on November 7 for Deroche, where I traversed three small islands in Nicomen slough in section 8 of township 24, east of the coast meridian.



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There a saw-mill is in operation, and the settlers in the vicinity are engaged in raising garden produce and dairying.

On November 10, I moved by the Canadian Pacific railway to Port Moody, where, after experiencing considerable unfavourable weather, I completed, on November 30, the subdivision of the forty-one twenty-acre lots withdrawn from timber berth No. 52, which I had investigated earlier in the season.

I then moved to Coquitlam, where I laid out thirty-four lots on the land withdrawn from timber berths Nos. 77 and 86, which I had also previously examined, and, having finished this, I returned to Vancouver and disbanded my party on December 13.

I have the honour to be, Sir,

Your obedient servant,

ROBT. B. MCKAY, D.L.S.



## APPENDIX No. 39.

## ABSTRACT OF THE REPORT OF A. M. NARRAWAY, D.L.S.

## MISCELLANEOUS SURVEYS AND RESURVEYS IN SOUTHERN ALBERTA.

On May 7, 1913, I left Medicine Hat for township 21, range 10, west of the fourth meridian.

My work there consisted of a resurvey of this township and a survey of a few section lines not run when the old river-lot lines were destroyed; this was completed on June 10.

Red Deer river runs across this township, and with the coulees on the south side which extend several miles from the river, breaks up the township very badly. It is fairly well settled and good progress is being made by the settlers especially those engaged in mixed farming. On the north side of the river there is considerable difficulty in obtaining water, and most of it is hauled from the river. The branch line of the Canadian Pacific Railway from Bassano to Empress is now nearly completed. This will afford a ready outlet for this vicinity as it passes about five miles south of the river, and the new ferry installed this season by the Government in section 2, township 21, range 11, will accommodate those living north of the river.

My next work, which was started on June 23 and completed on July 10, was a retracement of townships 6 and 7, range 30, west of the third meridian. To reach this location it was necessary to return to Medicine Hat, and thence go southwest past Elkwater lake, and across the Cypress hills. The country along this route is nearly all taken up and good fields of grain were seen. Elkwater lake and the small lakes in its vicinity, backed up by the thickly wooded Cypress hills to the south will make a very pretty and desirable summering place, and no doubt will be used as such by the people of Medicine Hat in the near future.

The Cypress Hills forest reserve cuts off the northerly one-third of township 7, but most of the remainder of the township is level prairie with very rich soil. There is a strip of this level land along the south boundary of the reserve from the east boundary of township 7, range 30, to the west end of the hills; this is known locally as "the bench." At present there is usually a summer frost which prevents the ripening of the grain and this land is being used for hay and green feed. It is the belief of the ranchers and settlers in this vicinity that summer frosts will disappear as the country becomes settled. It is hard to see that this will be the case on account of the large stretch of country immediately to the south which is so rough and rocky that it will probably be used for ranching and not for cultivation. There seems to be an unusual amount of rainfall along these hills which almost completely misses the country more than a few miles away. Numerous springs of excellent water are scattered throughout this district.

My next work, which was completed on July 23, was a retracement of township 6, range 5, west of the fourth meridian. This township is nearly all taken up, and the settlers are making very good progress. They appear to be meeting with great success with their crops. Abundance of good water can be obtained and both coal and wood are convenient. Within a couple of years the Weyburn branch of the Canadian Pacific railway will pass through Manyberries a townsite within three miles of this township.

From this township I went to township 2, range 15, west of the fourth meridian where two township corners were missing and there was a road allowance of abnormal width.



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After dealing with this we moved to township 2, range 9, and retraced townships 2, ranges 9 and 10 finishing on September 3. Milk river passes through both of these townships and with its coulees, which in many cases stretch four and five miles from the river, breaks up the townships so badly that they are unfit for farming purposes. They are admirably adapted to ranching however as is shown by the good condition of the cattle and horses at present grazing there. A great many rattlesnakes are found in these townships; I have sometimes killed ten or more in one day.

From here we went back past Manyberries and retraced townships 6, ranges 3 and 4. These townships are well adapted for ranching and are being used almost wholly for this purpose at present. Feed is a little scarce, but the ranchers claim that there is a great amount of nourishment in what grows. This appears to be the case as the cattle we saw were in good condition.

These townships were completed on October 7 and we returned to Carlstadt and then went north to township 18, range 10, west of the fourth meridian. As had been reported we found that Tide lake had dried up and we produced the section lines across the land formerly covered by water. It is doubtful if this land will be of much use for some time as the settlers state that each spring it is covered with water which stays fairly late in the season.

While in this vicinity we resurveyed the south boundary of township 19, range 9, as the road allowance had been found to be abnormal in several places.

Having finished the work in this vicinity on October 30, we moved to Red Deer river to survey some section lines not run during the original subdivision in townships 21, ranges 11 and 12, and township 22, range 12, west of the fourth meridian. These townships are badly cut up by the river and its coulees. To the north of the river the country is well settled and good progress is being made in spite of the lack of rain, but south of the river the country is all used for ranching.

It is in these townships that the fossilized remains of dinosaurs and other of the prehistoric animals are to be found, and while running our lines we found some very good specimens.

We completed these townships on November 28 and then moved to Lethbridge by way of Brooks. Here we traversed the left bank of Belly river across sections 25 and 36, township 8, range 23, as the river had changed its course in several places.

From here we went to Macleod, reaching there on December 6. We commenced the traverse of Oldman river on the 10th and continued it across townships 9, ranges 26 and 25, and township 10, range 25, west of the fourth meridian, completing it on December 27. We found that the river had changed its course in many places and that some of the islands had been joined to the main land.

I closed operations for the season at Medicine Hat, and reached Ottawa on January 2, 1914.



## APPENDIX No. 40.

## ABSTRACT OF THE REPORT OF R. NEELANDS, D.L.S.

## STADIA SURVEYS IN CENTRAL SASKATCHEWAN.

My work during the past season consisted of the stadia survey of lakes in the Humboldt and Prince Albert districts of Saskatchewan and was carried on in the following townships, all west of the second meridian: township 40, range 18; township 44, range 22; townships 38, 39, 40, 41 and 42, range 23, townships 39, 40, 41, 42, 43 and 44, range 24; townships 39, 40, 41 and 42, range 25; townships 40 and 41, range 26; township 46, range 28, and township 49, range 26. In the last named township a stadia traverse was made of the north bank of Saskatchewan river.

In this district there are many small lakes that had not been surveyed; these, as well as the larger ones that had been traversed when the townships were subdivided, were surveyed by means of stadia traverses.

The large number of these lakes is due to the frequency of enclosed basin-like hollows and depressions in a rolling country with few creeks and rivers and an almost level watershed. Few of these lakes have running inlets except in the spring or after heavy rains and fewer still have any outlets. They are subject to great variations in depth and area depending partly on the amount of precipitation, partly on the drainage effected by the cultivation of the soil and the clearing of the land, and sometimes on changes in underground drainage systems, on springs drying in some places and appearing in others, and on natural drains becoming obstructed or diverted.

The water is generally alkaline and often salty. The salt water is caused presumably by the absorption of salts from the soil, followed by excessive evaporation, but the reason why some lakes should be salt and others fresh is not easily explained. Lakes are often salty where there is no indication of alkaline salts in the surrounding country. Some lakes with running inlets and outlets are salty and others with no inlets or outlets are fresh while fresh and salt water lakes often lie close together.

Some of these lakes that are connected with Carrot river contain sucker, a species of the catostomidae but otherwise they have no fish. It is probable that some of the deeper fresh-water lakes could be successfully stocked.

In all of these townships the surface is rolling and covered with poplar bush with stretches of open or scrubby prairie. The poplar has been burnt and cut over till what is left is small, and though the growth is dense in places, the land is easily cleared as the poplar stumps soon rot, especially if cut in summer. When cleared, it is fine farming land and does not seem to be so susceptible to frost as the open prairie land. Homesteads in solid bush are now being eagerly taken up but there are still good homesteads left all through this district and good land for sale on easy terms.

The roads are fairly good considering that few of the settlers have been on the land more than ten years and that the district is still only partially settled. The greatest natural difficulty in road building is that the levelness of the country makes it hard to get good drains. The settlers realize the importance of good main roads and wisely confine their work to two or three of the road allowances in the township. The old trails, where still open, make fine roads.

More railways are needed in this district, many farmers have to haul wheat from twenty to thirty miles to market. This takes away their profits and discourages them from making improvements or increasing the area under cultivation.



The settlers as a whole are making splendid progress. The majority of them have had previous experience in farming in the older provinces or in the States. Agriculture is the sole industry and grain growing is the only branch of it to which much attention is paid. The soil is good and all grain crops do well. The yield and quality are excellent.

The land is still fairly clean but the settlers hardly appreciate the necessity of making a determined and concentrated effort to keep out noxious weeds. All of the settlers keep some cattle, pigs and poultry. Around Reynaud and Bonne Madone sheep are kept for their wool, which the settlers there card and spin into yarn. There too the settlers keep bands of horses and droves of pigs. The Galicians prefer cattle raising to wheat growing and keep the greater part of their homesteads for pasture. The high price of horses has made it impossible for many of the settlers to buy them and oxen are largely used, especially by the Hungarians and Galicians. The decline in the price of horses this fall, however, has extended their use. Many settlers are ignorant of the proper care of horses and of their treatment when sick, and their losses in horses have been costly. The settlers need education too with regard to the comparative values of well-bred and scrub stock and to the wastefulness of pasturing cattle on uncultivated land.

Muskrats are the only fur-bearing animals left which are at all plentiful. Many settlers increase their winter income by trapping them. Bears are occasionally seen but coyotes are not so common as on the open prairie. Deer, elk and moose are still found and moose ranged this fall as far south as township 40 in ranges 23 and 24. Grouse, ducks, geese and cranes are plentiful.

Many Europeans or their descendants have settled in these townships. South of township 42 most of the settlers are Germans or Hungarians. Around Bonne Madone and Reynaud and in township 44, range 22, there are a number of French settlers. There is a Norwegian settlement in township 40, range 18, and township 43, range 24, is settled by Galicians. While they have different standards of comfort and prosperity the settlers get along well together; they all seem to be contented with their homesteads and prospects, while they, at the same time, appear ambitious to improve them. They are well supplied with churches and schools, are comfortably situated, live well and are making as good progress as could be expected. The prospects for the future of this district are the best.



## APPENDIX No. 41.

## REPORT OF P. E. PALMER, D.L.S.

SUBDIVISION ALONG THE HUDSON BAY BRANCH OF THE CANADIAN NORTHERN RAILWAY IN  
EASTERN SASKATCHEWAN.

ST. JOHN, N.B., May 12, 1914.

E. DEVILLE, Esq., LL. D.,  
Surveyor General,  
Ottawa, Canada.

SIR,—I have the honour to submit the following report on my survey operations for the season of 1913-1914.

We left Prince Albert, the place of organization on June 2, 1913, for Hudson Bay Junction, which was my post office and base of supplies during the whole season.

Hudson Bay Junction is a busy little town situated in township 45, range 3, west of the second meridian at the junction of the Hudson and Prince Albert branches of the Canadian Northern railway. It has two stores and two hotels, and is the centre of the logging operations of the Red Deer and Ruby Lake Lumber companies, who together employ from 1,000 to 1,500 men in the woods during the winter. It is also a railway divisional point, and upon the completion of the line to Hudson bay it will probably have a large increase of business and population. There is very little agricultural land in the vicinity, though within the last few years a number of homesteads have been taken up, and potatoes and other vegetables as well as oats, hay and dairy products, are produced to some extent.

About three miles south of Hudson Bay Junction surveys have been made on Red Deer river with a view to developing power to be used in the manufacture of pulp. If this industry is established it will employ a large number of men and make a profitable use of large quantities of poplar and other wood, which is not suitable for the best grade of lumber.

There is also the village of Ruby Lake in section 10, township 46, range 3, west of the second meridian, on the Canadian Northern railway, six miles north from the "Junction". It has a normal population of about two hundred people, employees of the Ruby Lake Lumber company and their families and has a general store, a post office and mills.

Although the railway from Hudson Bay Junction to Pas has been completed for about seven years, a regular service has only recently been inaugurated, and it still leaves much to be desired. During the summer of 1913, however, many improvements were made to the road, to enable it to stand the heavy traffic occasioned by the building of the Hudson Bay railway.

My surveys extended along this railway from the north boundary of township 45, range 3, west of the second meridian at mileage 5 from Hudson Bay Junction, to the east outline of township 52, range 29 west of the principal meridian at mileage 58.

I commenced my operations by running the east outline of townships 45 and 46, range 2, which I reached by canoe on Red Deer river from Erwood, a station on the Canadian Northern railway, eight miles east of Hudson Bay Junction. I transported my outfit along this line by back-packing. I then moved to Chemong in township 49, range 1, on the Hudson Bay branch of the Canadian Northern railway. From there I moved my camp by push car along the railway as the work required, cutting toboggan trails from the right of way to reach the more inaccessible parts as soon as the ground



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had frozen sufficiently to carry horses. I established the east outline of townships 47, 48 and 49, range 2, by back-packing a small outfit along the part north of the railway, while I reached the part south of the track by toboggan trail cut from where it crosses the north boundary of township 47, range 2, to Leaf lake. I also cut a trail to run the north boundary of township 47, range 1. The east outline of townships 48 and 47, range 3, I reached by packing in from Chemong along the thirteenth base line. To run the east outline of townships 48 and 47, range 4, I cut a trail from the track near the twelfth correction line approximately to the first named line, thence north to the thirteenth base line thus avoiding many bad ravines and much rough country. From this trail I also ran part of the twelfth correction line. I lost considerable time on the east outlines of townships 48 and 47, ranges 3 and 4, owing to the heavy cutting and the difficulty of reaching them. I did the necessary subdivision in townships 46 and 47, range 3, townships 47 and 48, range 2, townships 48, 49 and 50, range 1, retraced the east outline of township 45, range 3, and resurveyed the east outline of township 46, range 3, all west of the second meridian.

This work kept me busy until December 27, when I moved my outfit to Chemong and from there to Otosquen in township 50, range 32, west of the principal meridian, running the east outline of townships 49 and 50, range 32, from those places. At Otosquen I did some subdivision in township 50, range 31, and from there moved to Cantyre, near the northeast corner of township 50, range 31. From there I cut a trail south to the thirteenth base and north to the fourteenth base line to run the east outlines of townships 49, 50, 51 and 52, range 31. I then moved to the east outline of range 30 and cut a trail to the thirteenth base line to enable me to run the east outline of townships 49 and 50, range 30. I also did subdivision in township 51, range 30, from this camp, and established the thirteenth correction line in this range. I then moved to township 52, range 29, and did some subdivision. Finally I moved back to Cantyre, from which camp I established the thirteenth correction line in range 31 and did subdivision in townships 50, ranges 30 and 31, and in township 51, range 30.

The country traversed by the railway between the limits of my work is for the most part muskeg. The soil of these muskegs is usually a fibrous peat, formed by the decomposition of peat litter moss (*Sphagnum Fuscum* Von Galleseeu), cup-moss (*Polytricum Juniperium*), Labrador Tea (*Ledrum Latifolium*), and spruce and tamarack trees; it is from three to twelve feet in depth over clay or gumbo subsoil. These muskegs are usually covered with a light growth of black spruce and tamarack from three to eight inches in diameter, the growth of which is very slow. Along the banks of creeks and where natural drainage exists to carry off the surplus water, the soil is usually clay or clay loam and is covered with a heavy growth of spruce and poplar, much of which is suitable for lumber and pulp. The growth of timber in this locality where suitable drainage exists, is very rapid, and when the land is cleared it will be suitable for growing vegetables, hay and the hardier grains. Along the railway, where there is some drainage, I have noticed grass growing in places where the covering of moss has been removed.

Most of the muskegs in this section could be drained, as the surface is usually slightly undulating. These muskegs freeze to a depth of about two or three feet in winter, and the frost remains in them until the first of August. There is an opportunity for the development of a peat fuel industry in this locality, and at the present prices of coal in the West, this would appear to be a subject worthy of investigation.

In connection with these muskegs, which at present seem almost worthless, I would like to call attention to the fact that the Government of the United States has imported into Alaska a number of Lapland and Siberian reindeer animals closely related to our caribou, whose food is moss, and whose natural habitat is muskeg and tundra. These animals thrive to such an extent in Alaska that there are now 42,000 of them. They have also been introduced into Labrador by Dr. Grenfell. There are



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enormous tracts of land in our Canadian West and more particularly in the locality of my work this year, that would make suitable ranges for these animals. The flesh of the reindeer is said to be excellent food, while its hide and horns are also valuable.

The Pasquia hills run parallel to and at a distance of three to six miles from the railway from mile 12 to mile 35. These hills are about four hundred feet above the general level of the country. The outer slopes are covered with a thick growth of poplar and birch, with some spruce and jackpine, much of which is suitable for lumber or pulp, while the higher benches have mostly been burned over thirty or forty years ago, and are covered with a second growth of jackpine, spruce and poplar. There is also a great deal of muskeg in places, covered with spruce up to ten inches in diameter. The soil in these hills is usually clay or loam, and is frequently stony. Many creeks rise there, flowing through deep ravines. On the eastern slopes, where my work was situated, these creeks all spread out to form a swamp at a distance of five or six miles from the hills and again emerge as tributaries of Pasquia and Overflowing rivers. For the most part the land in these hills is not suitable for agriculture, and with the exception of the timber on the slopes, there is, through the locality where my work was situated, very little milling timber. The lower slopes and southern extremity might be suitable for mixed farming, but are not likely to be settled for many years. These hills were explored during the summer of 1913 by the Forestry Branch for the purpose of learning if the district were suitable for a forest reserve. It would appear that this country would be more suitable for that than for any other purpose.

Pasquia river rises in the Pasquia hills and runs through township 49, range 1, west of the second meridian, and through townships 49, ranges 32 and 31, townships 49, 50 and 51, range 30, and township 50, range 29, and thence on toward Saskatchewan river. It varies in width from forty-five feet in township 49, range 1, to ninety or one hundred feet in township 51, range 30, with a current of from one to three miles per hour. It is navigable for canoes in most places east of the second meridian. There is good timber along its course in township 49, range 1. The water is good.

Overflowing river rises in the Pasquia hills and runs through townships 47 and 46, range 3, and township 46, range 2, west of the second meridian, into Leaf lake, thence towards the northeast, crossing the thirteenth base line near the east boundary of range 30, west of the principal meridian, at which point it is about one hundred feet in width and from two to four feet deep, and is navigable for canoes and small boats. There is much good poplar up to twenty-four inches in diameter along the banks, and in many places there are hay marshes and meadows which would afford plentiful pasturage for cattle. The water is good.

Leaf lake is crossed by the twelfth correction line on the east outline of range 2, west of the second meridian. It is about four and a half miles long by three miles wide and from three to ten feet in depth. The shores are marshy and clumps of reeds rise from the water in many places. It is the resort of large numbers of ducks and geese. The water is sweet and good in this lake.

Ruby lake lies in township 46, range 3, west of the second meridian and is about two and a half miles long and from one-quarter to one-half mile wide. It has no tributaries nor outlets and the water is strongly alkaline and unfit for use. The mill and plant of the Ruby Lake Lumber company are at the south end of the lake, around which their limits lie. The shores are marshy on the west, south and north sides, but mostly dry with a good beach on the east. It varies in depth from three to twelve feet.

Red Deer river runs through the southerly part of township 45, range 2, in an easterly direction. It is from four to eight feet deep, with a swift current, has many rapids and is navigable for boats and canoes. There is much good land along its banks and large quantities of poplar and spruce suitable for lumber. It is used by the Red Deer Lumber company for driving their logs.



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Besides the Ruby Lake mills the MacKenzie & Mann Lumber Co. have a mill at Chemong in township 48, range 1, and limits in townships 48 and 49, ranges 1 and 2. The Great West Lumber company have limits in townships 49 and 50, ranges 1 and 2. Ties were cut on permit in several places along the line during the past winter and there is still much good timber in this locality.

There are no minerals of economic value in this district. Game is very abundant. Moose and caribou are plentiful everywhere and black and cinnamon bears, deer and elk are found in many places, while partridges, ruffed grouse, prairie-chickens, pin-nated grouse and ptarmigan are constantly seen. Geese and the many varieties of ducks are found in the lakes, and the fur-bearing animals, such as muskrats, mink, ermine, otter, lynx, foxes and marten are plentiful enough to amply repay the labour of the trapper. Timber wolves are occasionally met with in the winter. There are jackfish, pickerel and gold-eye in Red Deer river and Leaf lake.

The climate appears similar to that of other parts of Saskatchewan in the same latitude. There is considerable rain in the summer and fall. The first frost occurred about August 20 and the lakes froze over about November 1, but there was very little frost in the ground before the end of December. The snowfall was light only about six inches before February 1, and not more than fifteen inches altogether. The weather during the winter was remarkably fine, only one day being lost from work on account of storm between the 1st November and the 16th of March. The lowest point registered by the thermometer during the winter was 51 degrees below zero. Survey operations can be carried on more quickly and economically in this district during the winter than at any other time.

I completed the work for which I had been given instructions on March 13, 1914 and on the 16th I paid off my party stored my outfit at Hudson Bay Junction and left for the east.

I have the honour to be, Sir,

Your obedient servant,

P. E. PALMER, D.L.S.



## APPENDIX No. 42.

## ABSTRACT OF THE REPORT OF T. H. PLUNKETT, D.L.S.

## BASE LINE SURVEYS IN NORTHERN MANITOBA.

My work during the latter part of the summer of 1913 and the following winter consisted of the survey of the thirteenth and fourteenth base lines from range 28 west of the principal meridian easterly to lake Winnipeg.

I organized my party in Winnipeg and obtained supplies at Winnipegosis; we left this latter place by boat on August 24. Our progress north on Lake Winnipegosis was very slow. North and west gales which had delayed us two days at Winnipegosis continued to hamper us. On August 29 we arrived at the mouth of Overflowing river with our boat leaking badly from having run on a submerged reef in the lake, thereby damaging most of our supplies.

From information I had previously gathered regarding Overflowing river I believed it easily navigable for canoes and small boats. This I found only partly correct. For a distance of about five miles up the river from its mouth, this stream is very shallow and consists of a series of rapids. Loaded canoes had to be pulled up the centre. After the rapids are passed the river is easily navigable for many miles for small boats and launches.

From my ranger, I learned that we could reach the commencement of our work by following the south branch of Overflowing river, a stream not hitherto shown on maps of the country. Accordingly we left the greater part of our outfit at the point where it was expected the base line would cross the main river and canoed up the south branch reaching a point only two miles east of the point of commencement of our work.

On September 3 work was commenced on the thirteenth base line. Many difficulties had to be contended with in range 27. Throughout the range the line crossed an almost continuous floating bog, so soft and wet that it was with great difficulty crossed by the members of my party. This bog is almost level and I doubt very much if it can be drained. The south branch of Overflowing river meanders through this country from its source, a short distance north of Red Deer lake. I believe this river has an underground connection with Red Deer lake, as it rises most abruptly, in the midst of a huge floating bog. The river appears to be well named as at high water it floods the country for miles north and west of range 27. This branch crosses the base line in section 32. It has low banks, a sluggish current, a mud bottom and a depth of eight feet.

In section 31 of range 26 the line crosses the main branch of Overflowing river, just above the series of rapids leading to its mouth. From there south along the river there are some fine locations for settlers particularly on the northerly side of the river. High land, wooded chiefly with small poplar and willow extends back on an average of from one half to one mile from the river bank. North of this strip of high land the level muskeg extending northward to the base line could be easily drained and I believe those portions of ranges 26 and 25, township 48 lying between the base line and lake Winnipegosis would afford good locations for a few settlers.

North of the base line in the southerly halves of townships 49 ranges 25 and 26 a few good patches of high land were seen, wooded with small poplar and willow, but the extent of these patches was very limited. The northerly halves of these townships as well as township 50 in the same ranges consist of floating bog, undoubtedly flooded



at high water by Overflowing river. Toward the easterly limit of range 25 we began to cross a series of ridges running about due north and south. These are wooded with jackpine with a sand or gravel soil on stratified limestone. Frequent outcroppings of the rock occur. The land seems too barren to be of agricultural value. Between the ridges are floating bogs sloping toward lake Winnipegosis. These could be drained and made productive. This succession of ridges and bogs continues to the middle of range 24 where the ridges disappear and moss muskeg with a scattering of large bogs characterize the remainder of the range.

On October 2 the line had reached the northeast corner of range 24. As navigation on the north end of lake Winnipegosis closes on October 8 it was decided to discontinue work on the thirteenth base, go south to Winnipegosis and on the way down to mound portions of the twelfth base. Previous to our leaving, a cache was built on the thirteenth base to be stocked with provisions for the winter work. We reached Winnipegosis on the night of October 15. The lake froze over on the 24th.

On October 20 the party arrived at Whithorn siding on the Hudson Bay branch of the Canadian Northern railway. Preparations were at once made to complete the mounding and levelling on the fourteenth base line in ranges 28, 29, 30 and 31 which had been left unfinished the previous season. Some difficulty was experienced on this work owing to the very soft and wet nature of the country to be crossed. Man-packing was our only mode of transportation until November 3 when ice on the rivers could be used, but the almost total lack of snow greatly hampered our work. By November 6 this work was finished, and the party was now occupied in moving supplies east in order to continue the survey of the fourteenth base line to lake Winnipeg. Supplies had to be dragged over almost bare ground and consequently progress was slow.

On November 17 the line was commenced at the northeast corner of range 28 and carried on continuously thereafter as far as range 16. Until Christmas the lack of snow greatly hampered our progress and the ill effects of the rough trails on our dogs were felt throughout the winter. On December 16 Saskatchewan river was crossed in section 35, township 52, range 23.

The country between range 27 on this base line and lake Winnipeg in range 11 can best be described in three sections. The first division takes in ranges 26, 25 and 24, the second includes ranges 23, 22, 21, 20 and 19 as far east as Cedar lake and the third extends from Cedar lake to lake Winnipeg.

In the first section the line traversed a country fairly thickly wooded with spruce, tamarack and jackpine, not sufficiently large for milling, and for much the greater part, too small and stunted to be of any commercial value. Ranges 27 and 26 produce mainly spruce and tamarack from six to ten inches in diameter. In ranges 25 and 24 jackpine predominates. As a rule the jackpine was very small and dense. The whole surface of the country in this division is covered with moss from one to two feet in depth. Patches of bog are found on all sides, but these are generally small. When drained this section of the country might be of value for farming.

The second section might be called the Saskatchewan river section. Excepting a very narrow strip of land along the banks of the maze of rivers and lakes found there the country is a continuous bog. Rushes, reeds and rat houses are the common characteristics. It appears to be a flooded country, absolutely useless in its present condition from an agricultural viewpoint. It would require a much more extended study of this section than it was possible for us to give it to predict what possibility there is of its being drained.

Crossing Cedar lake we found in the third division an altogether different type of country. Ranges 18, 17, 16, 15, 14 and 13 are mainly rolling and of a rock formation. In ranges 16, 15, 14 and 13 the flat limestone lies either on the immediate surface or a few inches beneath.

This is a continuous bush country producing jackpine almost entirely. Ranges 13 and 14 have been fire swept leaving for miles on either side of the base line a vast



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extent of bare limestone rock piled up with small *brulé*. The jackpine seldom attain a diameter of more than six inches. They appear to die for lack of soil.

Throughout this section for many miles both north and south of the line there are innumerable lakes of varying size. Almost all of these lakes have high rocky banks and gravel bottoms. The water is very clear and apparently pure. Clearwater lake in range 17 is one of the largest of these lakes. Whitefish and jackfish abound in it. Jackfish is found in almost all of the lakes. So numerous are these lakes that Indians from Moose Lake and Grand Rapids reserves are able to travel by canoe in almost any direction by making short portages.

In range 12 the elevation drops rapidly in a series of steep hills and narrow gravel benches probably old shore lines of lake Winnipeg. Throughout the greater part of this range however and through section 31 of range 11 where the base line reaches lake Winnipeg we traversed a bog and muskeg country wooded with stunted spruce and tamarack with occasional patches of jackpine. This strip of muskeg extends all along the lake shore, retaining a width of about six miles almost as far south as Grand Rapids settlement. About four miles north of the base line it becomes wider and extends northwesterly. This land undoubtedly could be easily drained and from an agricultural standpoint constitutes the only hope of this third section.

Work was carried on continuously on this base line from November 17, 1913, until February 3, 1914 when the line had been carried as far as range 16. A return was then made to the thirteenth base line in range 24 where the line had been left the previous fall.

From February until April we were occupied extending this line across ranges 23 to 14 inclusive.

From range 23 to the northeast corner of section 31, range 20, where the line intersects the shore of Cedar lake the country is wholly muskeg. The ground is covered with moss from one to two feet deep. Small floating bogs occur. The timber consists of stunted spruce and tamarack. Occasional bluffs were found with spruce up to ten inches in diameter but the quantity of timber is very limited. In the event of settlement this spruce would probably supply settlers with building timber.

In section 23, range 22, Mossy creek was crossed. This creek is about sixty feet wide, three feet deep and flows southeast with a sluggish current to lake Winnipegosis. Along the banks of this creek on a narrow strip of land spruce trees up to twelve inches in diameter are found. Larger timber consisting of spruce, poplar, birch and tamarack is found along the base line throughout range 22 and the western half of range 21. This larger timber however is not characteristic of the country and is found here only because of the proximity to lake Winnipegosis which lies about one mile south. North from the base line to Saskatchewan river the country is of the usual muskeg variety dotted with floating bogs. In this country the scrub spruce and tamarack is supplemented by a scattering of scrub cedar. Between the base line and lake Winnipegosis a very limited number of settlers could be accommodated without extensive drainage being necessary.

The easterly half of ranges 21 and 20 as far as Cedar lake is low wet muskeg of the usual type.

Cedar lake extends across ranges 20, 19, 18, 17 and range 16 as far as section 35.

From there to Saskatchewan river in section 33 of range 15 the line crosses a rocky country. The timber consists of spruce, tamarack and jackpine generally small but attaining in places a diameter of twelve inches. South of the line as one gets farther from Cedar lake the land again assumes the usual moss and muskeg characteristics.

From Saskatchewan river in section 33, range 15, to Cross lake in section 35, range 15, the line crosses a stretch of very fair land wooded with poplar, spruce, tamarack, jackpine and willow brush. This strip extends south of the base line to the river and north of the base line about four miles and would afford a few good locations for settlers.



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The easterly shore of Cross lake is crossed in section 31 of range 14 and from there on to lake Winnipeg the base line runs parallel to Saskatchewan river. This country is underlaid with limestone and frequent outcroppings of the rock occur. The soil is very poor. South of the base line to the river and extending north of the line an average distance of about one mile, there lies a belt of fairly good spruce, jackpine, poplar, birch and tamarack. This timber is easily available at Grand Rapids settlement and may become of value in the future development of this place which I believe has lately been incorporated as a town. In section 34, township 48, range 13, the country drops rapidly and the strip of muskeg along the shore of lake Winnipeg is crossed. This muskeg where the line crosses is only half a mile wide but becomes rapidly wider north of the base line.

The Provincial Government of Manitoba commenced a drainage scheme just west of Grand Rapids this summer with a view to reclaiming this muskeg. It is estimated that about 500 acres will be drained as an experiment. As this muskeg is typical of a vast area of the north country it may be of advantage to intending settlers to describe the methods and implements used in draining it.

The pick and shovel are of secondary importance in this work. The main ditch is first laid out the proper width, usually from six to eight feet, and marked by pickets every hundred feet. One man on either side of the drain then cuts the moss from station to station along the drain with an ordinary hay knife designed originally for cutting hay in the stack. These knives when they are to be used for muskeg ditching should be cut off about six inches below the handles and a piece of iron one foot or so in length depending on the depth of the moss welded in. A third man then cuts the moss across the ditch in strips from one to two feet in width and these strips into squares of eighteen inches or two feet. Following these three men are four others with iron hooks, lifting these squares of moss and muck permeated as they are with small roots which hold the squares together onto the bank of the ditch leaving a berm of two or three feet.

These hooks are manufactured for the purpose from five-eighths inch iron rods. Two rods are fastened together at the handle and also firmly banded together at the bend for the hooks. The hooks are placed at an angle of about thirty degrees with one another. Ordinary manure forks with the prongs turned at right angles to the handle were first used but were found too light to withstand the strain.

Immediately behind these men follow three others with shovels, who level the bottom roughly to grade. It has been found in very wet bogs and muskegs that when the ditch is carried up to a small slough the rush of water will scour the bottom muck out to grade. In some country where old beaver dams are found holding bodies of water it has been found very advantageous to remove only every alternate block of moss before breaking the dam, the resulting rush of water doing the rest of the work.

In the muskeg west of Grand Rapids settlement ten men were able to complete one thousand feet of main ditch in one day. At intervals depending on the level of the ground, but at least every fifteen hundred feet in ordinary muskeg, lateral ditches two or three feet wide are run to the main ditch. As a rule the removal of the moss is all that is required.

This system of drains enables the settlers to use horses or oxen with which to turn under the moss which is undoubtedly the cause of this boggy area. On a very large percentage of this muskeg country the drains need not be made with a view to making them permanent watercourses. There is at present ample slope for natural drainage. All that is needed is sufficiently firm footing for horses or oxen to enable the settler to get rid of the moss. Once this is removed drainage will be no more a problem here than elsewhere.

On April 6, 1914, the thirteenth base line had been surveyed across all lakes. A return was at once made to the fourteenth base line in range 16. Advantage was taken



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of the ice and snow to reach range 16 and distribute provisions easterly in three caches to lake Winnipeg. We were just able to accomplish this before the spring break-up came. The work from range 16 to lake Winnipeg was carried on with man-packing as our means of transport.

The base line having been completed block outlines were run south along the east boundaries of townships 52 and 51, range 13, and the party then returned to Grand Rapids by canoe, our boats having arrived from Pas by the first open water. The thirteenth base line was then extended to lake Winnipeg and block outlines run north to the northeast corner of township 50 range 13. After the completion of the base lines and the adjoining block outlines tie lines were run to Grand Rapids settlement and Indian reserve.

By July 1 our work was completed. On the 4th we left by tug for Black river where we connected with the steamship *Wolverine* for Selkirk, Manitoba. The party was paid off at Winnipeg on July 6. The country traversed by these two base lines abounds in game. Moose and caribou are very plentiful throughout the whole country between the second meridian and lake Winnipeg. Scarcely a day passed without these animals being seen by members of the party. East of Cedar lake bears, marten and foxes are plentiful. Muskrats are trapped in large numbers by the Indians in the sloughs and bogs that are found on all sides, mink, lynx, weasel and otter are also taken in large numbers but beaver are rare. Small game such as ducks, geese and grouse of all kinds including ptarmigan is very plentiful.

No valuable minerals were found by the party but claims of red ochre were staked at Cross lake this spring by prospectors from Grand Rapids. The quality seems to be good but as yet it has not been found in sufficiently large deposits to be of commercial value. Samples of what appeared to be potters clay were also brought from Cross lake. East of Cross-lake splendid limestone in thick strata is found throughout the country.

Fishing and fur-trading are the only industries flourishing in this country. Extensive operations are carried on on lake Winnipeg, lake Winnipegosis, Moose and Cedar lakes and on Saskatchewan river. The most valuable fish taken are whitefish. Owing to the heavy freight rates from the north end of lake Winnipeg whitefish only are taken. On lake Winnipegosis however, jackfish or pike, gold eye, pickerel and even sucker are freighted to the railway at Mafeking. The winter fishing offers wide opportunities to settlers and during some seasons summer fishing is permitted.

Excepting a few small gardens at Grand Rapids settlement no attempts have as yet been made to cultivate the soil. Potatoes and all other garden vegetables are grown successfully at the settlement.

The early fall of 1913 was very cold. The thermometer dropped to 10° below zero on October 19. After that the weather became milder and no cold weather occurred until nearly Christmas. The winter until February was mild. During that month however, the temperature dropped as low as 58° below zero. Three weeks of very severe weather extended from February 1 to 21.

The spring of 1914 was late, snow remained in the bush until the last of April and the ice on the lakes could be travelled on well into May.

It was June 1 before there were any signs of growth in the bush. Frost at night was noticed as late as June 25. Residents of the country considered this a very late spring.

As a rule the flow in rivers crossed by our lines was slow. No water-powers were noted excepting Grand rapids on Saskatchewan river at Grand Rapids settlement, and the rapids on Overflowing river near its mouth on lake Winnipegosis.



## APPENDIX No. 43.

## ABSTRACT OF THE REPORT OF R. C. PURSER, D.L.S.

## MISCELLANEOUS SURVEYS IN MANITOBA, SASKATCHEWAN AND ALBERTA.

The surveys on which I was engaged during the season of 1913 were quite similar in their character to those I had been on during the previous year. They consisted of scattered miscellaneous surveys of every nature extending throughout the more northerly parts of Manitoba, Saskatchewan and Alberta. The greater part of my work lay in the province of Saskatchewan, and so I found it convenient to use Saskatoon as a sort of headquarters during the season. My party consisted of one assistant and myself supplemented when and where necessary by local labour. In all, thirty-one different surveys and investigations were made, my time spent in field work extending from April 23, 1913, to January 24, 1914, making an average of about one survey per week. A considerable part of the time was spent in travelling from one place of working to another, both by train and by wagon or democrat, our total mileage for the former being over seven thousand one hundred miles, exclusive of our initial and final trips to and from the West, and for the latter over eight hundred miles. We had no transport outfit of our own, hiring the same whenever necessary the advantage of this arrangement being the ease with which we could move from one part of the country to another by train, shipping our small outfit with us as baggage. Most of the surveys on which we were engaged were small, some requiring not more than one actual working day for their completion. A rough classification of the surveys made during the season would be as follows: Eleven retracements for the purpose of correcting monuments out of place or duplicate monuments; five investigations of the condition of monuments; eleven lake traverses; two investigations of lakes supposed to be dried up; one river traverse, and one investigation of timber berth lines.

The retracements first mentioned were mostly for the purpose of correcting small errors in localities where they had been petitioned for by the settlers affected.

Some of the lake traverses above mentioned were held over until cold weather had set in and the lakes had frozen up. Working over the ice did away with a great deal of line cutting which we otherwise would have had to do. In the eastern part of the province of Saskatchewan, particularly in the vicinity of Yorkton, the lakes and sloughs were all found to be filled with water to a much greater extent than they had been for years.

I traversed the left bank of Saskatchewan river through township 33, range 6, west of the third meridian. This work was done in September and owing to the almost impenetrable brush through which our traverse lines had to be cut, it lasted well over three weeks.

In township 55, range 5, west of the third meridian, a fruitless search was made for a timber berth block supposed to exist there. In reality the block did exist some twenty-four miles farther south, the discrepancy being due to a confusion of the neighbouring timber berth numbers on the original surveyor's blue prints.

In addition to the surveys above mentioned we were required to take observations for the determination of the magnetic dip and total force, whenever we could do so without interfering with our regular work. In all forty-eight sets of these observations were taken, the instrument stations here extending through a wide range of territory. At the beginning and the end of the season the instrumental constants were determined at the Magnetic Observatory at Agincourt, Ontario.





Photo by O. Rollson, D.L.S.

#### Shallow Shore of Waskik Lake.

This lake is situated in township 64, range 9, west of the Principal meridian. The shore is very shallow, and the soft muddy bottom prevents even the use of canoes near the shore, unless pushed along through the mud. Though the men appear to be knee-deep in water, there is really not enough to float the canoe, as they are walking in nearly a foot of soft mud.







## APPENDIX No. 44.

## ABSTRACT OF THE REPORT OF C. RINFRET, D.L.S.

## STADIA SURVEYS IN SOUTHERN SASKATCHEWAN.

I left Montreal on May 2, 1913, for Maple Creek, Sask., where I organized my party.

I then moved by trail via Swift Current to township 6, range 27, west of the second meridian, and began the traverse of Willowbunch lake on May 30.

During the month of June we traversed Willowbunch lake and the lakes in township 5, range 24, townships 6, ranges 24 and 25, and townships 7, ranges 24, 25 and 26, west of the second meridian. The part of the country northeast of Willowbunch lake is well settled and partly cultivated, yielding good crops of wheat, flax and oats. The part southwest is cut up by coulees, but has some fairly level spots so that mixed farming and ranching is carried on successfully.

The lakes in township 6, range 29, were next traversed. The country south of Montague lake is hilly and partly covered with poplar and brush.

We then proceeded to survey Fife lake and the surrounding lakes in townships 3 and 4, ranges 29 and 30. The country north and east of Fife lake is excellent for farming and is fairly well settled, although there are still a few vacant homesteads. The country south and west is hilly, but has many level spots where farming and ranching is carried on. The district around this lake is in my opinion the most suitable one for settlers seen during the season.

Our next work was in townships 4 and 5, ranges 27 and 28, and in townships 3 and 4, range 26. All of this country is rolling to hilly and farmers and ranchers are equally successful.

We then traversed the lakes in townships 3, 4 and 5, range 23, townships 5 and 6, range 24, and townships 5 and 6, range 22. Farming is the principal industry in these townships, all of the suitable land being taken up.

The traverse of Big Muddy lake was our next work. The country south of this lake is very hilly and does not seem to be settled, although ranching would be advantageous if communications with the railroads were more convenient. In township 2, range 22, north of the lake, and townships 3, ranges 22 and 23, there are some ranchers and farmers, but many good homesteads are still vacant.

We then moved to township 7, range 19. This township is all taken up and well farmed.

All the bodies of water in townships 3, ranges 20 and 21, townships 4, ranges 20, 21 and 22 and townships 5, ranges 20 and 21, were then traversed. In each of these townships from ten to thirty-five lakes or sloughs were found. These swarm with ducks and muskrats and some settlers make considerable money trapping muskrats. Most of the lakes contain potable water. That country is well adapted for mixed farming and ranching, and could be more thickly populated.

The remainder of the season was spent in investigating two or three townships which had no lakes and in traversing the lakes in townships 6, ranges 21 and 23, townships 7, ranges 20, 21 and 22 and townships 8, ranges 20 and 21. These townships are convenient to railroads and consequently well settled.

As a rule the lakes and sloughs have been drying up for the last few years, but there are a few exceptions, the most noteworthy being Fife lake which is now three feet deeper than it was some years ago. This was the only lake surveyed which has



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an outlet and the only one containing edible fish in sufficient quantities to be caught with nets. Glen lake situated four miles south has completely dried up.

The depth of the lakes and sloughs surveyed was generally about three feet or less, while a few were five to ten feet deep. The deepest one was fourteen feet. Most of the smaller lakes and sloughs contain drinkable water, while the big ones, with the exception of Fife lake, contain alkaline water.

In all the district travelled over, lignite coal is common and in many places it is mined and sold to the surrounding farmers at from one-fourth to one-fifth of the price of the better grades of coal sold in the neighbouring towns.

I closed operations on November 25.



## APPENDIX No. 45.

## ABSTRACT OF THE REPORT OF E. W. ROBINSON, D.L.S.

## MERIDIAN AND BASE LINE SURVEY IN NORTHEASTERN SASKATCHEWAN.

I left Ottawa on August 8, 1912, and proceeded to Prince Albert to complete the survey of the fifteenth base line west of the second meridian. Upon my arrival at Prince Albert I discovered that the season was wet, and after ascertaining definitely that the Candle Lake trail was in an almost impassable condition I decided to leave this line until a later date, as I was anxious to make an early start on the second meridian. I therefore went to Pas and made arrangements for my winter transportation. In the meantime I had a small party mounding on the fifteenth base line east and west of the second meridian.

I decided to use horses and toboggans for the heavy freighting, keeping in the meantime a small number of dog teams for light work and where speed was necessary. Up to this time horses had never proceeded north of Pelican narrows and my venture was looked upon with considerable misgiving by those familiar with northern travel, but I am pleased to state that I found them a perfect success. When north of Churchill river my horses were inspected by a number of the Indians with curiosity, for they had never previously seen any, and one was surprised to find that they had no horns. I used the horses up to March 28 which was the latest date I could keep them so as to enable them to reach Pas before the break-up. From this date I used the dog trains until the snow went which unfortunately occurred a few days later. I was then obliged to resort to man-packing for the rest of the trip, except on large lakes where the dogs assisted. This early disappearance of the snow is exceptional in this latitude. We had considerable cold weather after that but never enough snow to enable us to use the dogs for overland transportation.

Previous to my experiment the dog train had been relied upon for all northern winter transportation, but when a survey is undertaken at this distance from railways the number required even when one has a cache of provisions reasonably close to the work, is so large that the transportation becomes unwieldy. The great disadvantage of using dogs lies in the fact that every dog team requires a driver and one team on a good trail will not carry more than 400 pounds and usually less. On the other hand a horse toboggan can be relied upon for 1,600 pounds on a good trail, and the saving of blankets, food and tent accommodation for the extra drivers is very considerable. It is undoubtedly desirable that horses should be tented, but this is not absolutely necessary. Horses of the right stamp, namely of about 1,200 pounds weight and preferably of the broncho strain, will do well if properly-blanketed and tied in a sheltered situation. Heavy feeding is absolutely necessary to enable them to stand winter work of this description, which is hard on them, and all their ailments should be at once attended to. The heavy mortality amongst horses engaged in winter survey work is largely due to lack of food. It is impossible to expect a horse to work hard on dead grass and a few oats grudgingly handed out. The cost of taking in proper feed may be high but this is preferable to having the party tied up through the collapse of transportation. It seems to be more difficult to ensure against dogs dying. For one reason no general systematic attempt has been made to breed up dogs suitable for work, as is the case with horses. The husky dogs are justly famous for their stamina, but they die sometimes with very little apparent cause. There is no doubt that generally



speaking dogs are over-driven, and as it does not seriously hurt a well-fed dog to go entirely without food for two days, and thus while working there is a tendency to underfeed especially if the procuring of dog feed entails some trouble. Many dogs will work when completely exhausted and show no sign of their condition particularly to an inexperienced driver while a horse shows signs of fatigue long before exhaustion comes, and he is usually unhitched and taken to camp.

We left Pas to continue the second meridian northerly from township 67, on December 24, 1912, this being the earliest date at which it was safe to leave. The country around Pas is swampy and if heavy frosts do not come before the first snowfall, it is always late before it is safe to travel with horses. We proceeded by the Cumberland House trail and thence to the northeast corner of Beaver lake where some delay was caused by the difficulty in finding a cache. We then travelled up the trail already cut by the men I had sent ahead, and arrived at our starting point on January 10, 1913. The country through which this trail passes is rolling and very rocky in places. It is fairly well timbered with small spruce, tamarack, jackpine and poplar, except where a few small fires have swept through. There are many lakes and the soil is sandy with usually a rocky subsoil.

I commenced running the second meridian on January 13. Through township 68 the meridian crosses low rocky ridges with muskegs between. The soil is sandy with considerable surface rock and is unfit for agriculture. Small spruce, jackpine and tamarack is found and a few small areas of spruce up to ten inches in diameter. Close to the north boundary of section 25 the line enters a lake which forms one of the main routes of travel to the north both in summer and winter. This lake is very irregular in shape consisting of long bays running roughly in a northerly and southerly direction. At the south end a water route leads northwesterly to Wildnest lake and another leads to the east.

Proceeding northerly through township 69 the country becomes rougher. The ridges are broken and rock bluffs are common. The soil is sandy and very rocky and consequently is of no use for agriculture, except in some low-lying sections of small extent where a fair sandy loam is found. Scrub spruce, jackpine and tamarack cover all this area. The lakes are deep with rocky shores and clear water, and are fairly well stocked with whitefish, jackfish, trout and pickerel. Fur-bearing animals seem plentiful particularly foxes and lynx. In section 29, approximately, there is a fall of about twenty-two feet between two lakes which could easily be developed into a power site and smaller falls exist at several other points.

Through township 70 the surface continues broken and rocky. The soil is sandy with considerable surface rock and is useless for agriculture. The timber is a little larger than to the south and the same varieties were seen up to ten inches in diameter. Difficulty of access and smallness of area take away their value for milling purposes. In sections 24 and 25 we crossed a bay of the lake previously mentioned and from the east side of this bay I made a horse trail running to the north end of Wildnest lake. From this point there is a well-known water route leading to Birch portage on the Sturgeon-weir river between Beaver lake and Pelican narrows.

Through township 71 the line crosses only one small lake in section 25. The surface is broken but not so rocky as to the south. The soil is very sandy on the ridges, but in the lower places where it is not muskeg we found a very fair sandy loam. On the top of the ridges there is jackpine up to ten inches in diameter and spruce, tamarack and poplar of the same size on the slopes. West of the line there is a long bay of the lake to the south, and farther west can be seen a high rocky ridge. Fish are not very plentiful there, but fur-bearing animals abound, principally foxes, lynx, mink and otter.

Entering township 72 the line drops to the valley of a lake lying mainly to the east of the line. This lake is shallow and has swampy shores in places. The long bay seen west of the line in township 71 ends here and is connected by creeks and a small



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lake with another lake lying for the most part in township 73. There are rapids on both the connecting creeks suitable for power development. The country through this township is broken but not so rocky as farther south. Jackpine up to six inches covers the tops of the ridges and spruce and occasional patches of poplar and birch are found on the slopes. The land drops generally in a northeasterly direction towards Kipahigan lake lying to the east and northeast.

In township 73 the line crosses two bays of Kipahigan lake. This is one of the prominent lakes of this district, and there is a small Indian settlement on the south-eastern corner, at the mouth of a river about two chains wide running southeasterly. There is a water route from this settlement to Kississing lake which lies on the direct route from Cumberland House to Pukkatawagan. There is also another route leading northerly to the Indian settlement on Sisipuk lake which is a bay of Churchill river. Kipahigan lake is well stocked with whitefish, jackfish, pickerel and sucker. The district seems a good one for fur and the residents make large catches of foxes, lynx, mink and otter. On the east side of the lake the country is rough and rocky and a considerable area has been burnt over. West of the lake the surface is not so rough but there are gravel and rocky ridges timbered with small spruce, jackpine and tamarack. There are muskegs between the ridges and small lakes. The soil is sandy with considerable rock.

In township 74 the north bay of Kipahigan lake is crossed. Along the shore there is a narrow fringe of spruce from eight to ten inches in diameter. To the west of the line the country is broken and covered with small jackpine and spruce, and occasional small birch and poplar. The soil is of no use for agriculture, being sand and rocks.

In township 75 a bay of Kipahigan lake stretches to the west and there are many islands carrying spruce and tamarack up to ten inches in diameter. A water route to Pelican narrows leaves the west shore. The line crosses a very rough broken rocky country and precipitous rock bluffs are common. Many of the ridges have been burnt over and are now covered with a growth of small poplar, birch, spruce and jackpine but in other places jackpine up to six inches is found. Many small muskegs occur all through the district. The soil in the depressions between the ridges, where there is no muskeg, is a light sandy loam. Fur is still plentiful, and good catches of foxes, mink, lynx and otter are made every year.

In township 76 the northern extremity of Kipahigan lake is reached and the meridian crosses a number of bays on the east shore. The country is very rocky with precipitous bluffs, and small jackpine, spruce, poplar and birch cover the ridges. The soil is sandy and very rocky except in depressions where there is a fair sandy loam. Fire has burnt over some sections. To the east the country is even more rocky and broken.

In township 77 the meridian crosses several arms of Sisipuk lake, one arm of which runs to the north along the meridian and almost reaches Churchill river, thus forming practically an island. The shores of Sisipuk lake are not so rocky as the shores of the lakes to the south, and they are generally well timbered with spruce, poplar and birch up to eight inches in diameter. The arm stretching in a northeasterly direction forms part of one of the water routes from Pelican narrows to Pukkatawagan, along which there is a considerable amount of travel. The islands are generally well timbered with spruce, tamarack and jackpine up to ten inches in diameter. It was noticed that the islands in all these lakes are usually better timbered than the mainland. The soil also is better, usually a very fair sandy loam, and the Indians living on this lake cultivate small patches on the islands. In section 24 there is an Indian settlement of six houses and both the Hudson's Bay company and Revillon Frères have traders there. A considerable quantity of fur is handled every year, foxes, lynx, beaver, mink, otter, bears and weasels being the principal varieties. All the district is apparently well stocked with fur-bearing animals and every Indian with any energy can make a good catch. The lake is well stocked with whitefish, pickerel, jackfish and sucker. The country



lying to the west of Sisipuk lake is very rough and rocky and is sparsely covered with scrub spruce and jackpine.

In township 78 the meridian crosses the north end of the west bay of Sisipuk lake. Along the northeastern shore there is a strip of sandy loam covered with spruce, poplar, and birch. The surface is somewhat rolling, but there are several small areas of good agricultural land. Inland in an easterly and northeasterly direction we found a broken and rocky country with small spruce, tamarack, birch and poplar. The soil was sandy and very rocky, and of practically no use for agriculture. To the west of the bay the surface was rolling and timbered with spruce, poplar and birch up to eight inches in diameter with a few swamps and muskegs. The soil is mostly a light sandy loam with patches of a heavy clay loam. Rocky ridges are also in evidence.

In section 1, township 79, we crossed the southern shore of Churchill river. The river during this part of its course is more truly a string of irregularly shaped lakes connected by narrow channels, usually with rapids in them. The shores have a fairly gentle slope back from the water's edge, although it is very rocky in some sections. The banks are well timbered with spruce, poplar and birch up to ten inches in diameter, although most of it is under this size. The islands, of which there are a large number carry better timber of the foregoing varieties. All along both banks of the river, and more particularly on the islands, there are areas of good agricultural land. The soil varies from a sandy loam to a clay loam and is comparatively free from rock. Hay can be cut in swamps at the head of some of the bays, one good place being the bay lying to the east of the line in townships 79 and 80. The river is well stocked with sturgeon, whitefish, jackfish, pickerel, trout and sucker. As a fur country it appears good. All the Indians had good catches of beaver, foxes, mink and otter. There is a small Indian settlement of about five houses east of the meridian at the mouth of Loon river, which enters the Churchill from the north.

In township 80 after leaving Churchill river the land rises to the north and the line crosses an area of rolling land, becoming broken toward the northern part of the township. To the west of the line in the southern part of the township, the country slopes down to a bay of Churchill river but to the east it is high. A creek about sixty links wide was crossed in section 25 running southwesterly to the river. It is very unsuitable for canoe travel owing to numerous obstructions and rapids, but at high water it is passable for small canoes. It receives several small tributaries during its passage from a lake crossed in township 81 to Churchill river, and there are several falls on these which could be utilized for small water-powers. West of this creek the land is broken and cut up by ravines. Spruce up to six inches in diameter, poplar, birch and tamarack cover the slopes with jackpine on the summits of the ridges. The soil is a sandy loam and very rocky. To the east of the creek the land is high carrying spruce, poplar, birch and tamarack up to eight inches in diameter with many swamps and muskegs. The soil varies from a sandy loam to a clay loam and surface rock is usually present.

In township 81 the line crosses a lake. To the east the country is high and rolling covered with small jackpine, spruce, poplar and birch and the soil is sandy and very rocky. To the west we found a broken country with jackpine and spruce up to six inches with some poplar, birch and tamarack. There are some small patches of sandy loam land.

A small lake was crossed in section 1 township 82, and from the northwest corner a portage of about half a mile leads to the south end of a long lake lying to the west of the meridian. To the west of this lake the surface is high, rolling and rocky, covered with small spruce, tamarack, jackpine, poplar and birch and there are many small lakes. The soil is sandy with considerable rock. To the east of the meridian the country is similar with many bare ridges.

In township 83 several small lakes were crossed before reaching the south shore of Kamuchawi lake in section 24. The land on both sides of the meridian is high, roll-



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ing and rocky with many small lakes and is covered with small spruce, tamarack, jackpine, poplar and birch. The soil is sandy with considerable rock, with the exception of fringes around some of the lakes where a fair agricultural soil is found varying from a sandy loam to a light clay loam. Kamuchawi lake is a large body of water lying partly in townships 84 and 85 and on both sides of the meridian. It is deep with clear water and is well stocked with trout, whitefish, pickerel and jackfish. Its shores are well timbered with spruce, jackpine, poplar and birch up to six inches. It is drained from the northeast corner by Loon river. This river constitutes a well known water route. It expands into a number of lakes and in its narrow parts is usually full of rapids; the portages however are good. It reaches the Churchill in township 79 east of the meridian. When it is decided to continue the second meridian farther north, this will be the best way to reach the end of the line in summer from the Churchill. At the northwest of Kamuchawi lake a bay stretches to the west and from this point there is a water route to Reindeer lake. I have been told that there is a lake of considerable size called Rabbit lake situated to the north of Kamuchawi lake. Between Kamuchawi lake and the Loon river the country is very rough and rocky with scrub spruce and jackpine growing thereon.

We finished running the line on May 12. I sent the party back over the line to do the mounding and the levelling to Churchill river while I returned to the main camp in township 81, and started from there with canoe and supplies to go by the Loon river route, to the end of line to get a latitude observation. We had a hard and strenuous trip. The lakes on this route were only partly open. I was able to pick up a jumper and when it was impossible to travel with canoe, we would cut our way through slush ice to where it was fairly solid, and then take the canoe out, place it on the jumper and travel on the ice until it became too rotten to proceed any farther. Then cutting a trench in the ice the canoe would be placed therein and forced into open water. I arrived at the north end of Kamuchawi lake on June 4 and commenced taking latitude observations. This I continued up to the 13th with excellent success. On this day, however, we unfortunately had a bush fire that burnt our camp out. We lost practically all the camp outfit, food, personal belongings, etc., but worst of all some of the records of this survey. The latitude observation records were destroyed and one azimuth observation book and some accounts and field books were partly burnt. I returned at once to the party who by this time had reached the Churchill, and as I had neither the supplies nor the outfit to stay and obtain the missing information I decided to return to Pas. I went to Pukkatawagan to obtain canoemen and an extra canoe. Pukkatawagan is a fairly large Indian reserve situated on a bay of Churchill river. It is a picturesque spot and the land, although light, seems to be productive. I was informed that all the common vegetables can be raised to perfection. The season is short but the rapid growth caused by the long days of summer compensates for this. I obtained the necessary canoemen there and returned to my main camp.

The quantity of land suitable for agriculture in the country traversed by the second meridian between townships 67 and 85 is very limited. The lakes are well stocked with whitefish, jackfish, pickerel and sucker. Fur-bearing animals abound, the principal varieties being foxes, lynx, mink, otter, beaver, bears and weasels. The barren land caribou, in their migration, reach the Churchill in winter and leave about the third week in March. These provide an excellent supply of fresh meat during the winter. The caribou seem to be coming farther south every winter. In summer time moose may be obtained as far north as Churchill river and a few stragglers even farther north. In winter time the moose all migrate to the south. It was reported to me that there are some bush caribou here, but I did not see signs or tracks of any.

On June 21, we started down to Pas travelling by Barrier, Kississing and Cumberland lakes. This is a well travelled route and the portages are fairly well cut. We arrived in Pas on June 30, and I paid off my party on July 1.



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I then had instructions to complete the mounding of the fifteenth base line between the second and the third meridians. The water in Saskatchewan river was very high and I knew that the swamps through which the line passed would be wet, but on July 28 I left Pas for my starting point. I found that the line was impassable and went farther up stream to two other points on the line, but the same conditions prevailed. I accordingly returned to Pas. I again left Pas on August 25 as the water had fallen considerably, and found that it was possible to get through some of the swamps. The work was slow and laborious, but I was able to bring supplies by canoe to several points by the Saskatchewan and Torch rivers, and man-packing was resorted to between these points. From range 10 the canoe work ceased and man-packing was the only method of transportation. A delay was caused by a large floating muskeg which could not be crossed until the surface was frozen. Three dog trains were used when it was possible for them to travel. The work was completed and the party returned to Pas on February 25, 1914. Two men who unfortunately had their feet frozen arrived on March 7.



## APPENDIX No. 46.

## ABSTRACT OF THE REPORT OF O. ROLFSON, D.L.S.

## BASE LINE SURVEYS IN NORTHERN MANITOBA.

My work during the summers of 1912 and 1913 and the intervening winter consisted of the survey of portions of the fifteenth, sixteenth and seventeenth base lines west of the principal meridian.

I organized my party at Selkirk and left for Norway House on June 10, 1912, travelling by the steamer *Wolverine* to Warren's landing, and by the Hudson's Bay company's boat *Highlander*, the remainder of the distance.

Owing to very stormy weather on lake Winnipeg, the barge with my supplies was so delayed that it did not arrive at Norway House until June 18. As soon as it was unloaded I left with canoes travelling up Jack and McLaughlin rivers to the principal meridian and then packed north to the fifteenth base. The following day, June 27, I commenced cutting the line and continued until July 30, it being then completed to Playgreen lake.

As Kiskittogisu and Kiskitto lakes which are crossed by the sixteenth base are too large for triangulation, I moved down to Cross lake and commenced running the seventeenth base. My plan was to run enough of this line in 1912 so that it might be completed as far as necessary the following summer. After running five ranges I left a small party at Cross lake to do some miscellaneous work and moved the main party back to Norway House, from which place we commenced moving supplies to Sea falls to be ready for the winter's work along the sixteenth base.

On October 21 I commenced work on this line and continued it until April 8, 1913, by which time I had run 150 miles. The warm spring weather was then melting the snow so fast that I was compelled to cease work and move into Pas, travelling via Cormorant and Clearwater lakes, and the Hudson Bay railway grade. We moved none too soon as two of the teams broke through the ice on Cormorant lake. At Pas I disbanded the party and made preparations for completing the seventeenth base to Reed lake.

On June 6, I again left Selkirk for Cross lake by the same route as before. On the 18th, I commenced running the seventeenth base and continued until October 2, by which time it was completed to Reed lake in section 36 of range 20. I then moved to Cormorant lake via the regular canoe route and on December 9 completed the sixteenth base to the second meridian. After this I returned to Pas and disbanded the party.

In the summer of 1912 I had all my supplies for the eastern part of the line shipped directly to Norway House and then moved to Playgreen lake and Cross lake as required for the different parts of the work. I also had supplies shipped by boat from Pas to the narrows on Cormorant lake, and placed in cache there for use on the western part of the sixteenth base. In March of 1913 I had supplies for the westerly end of the seventeenth base shipped by the railway contractors by means of horse teams from Pas to camp 7 near Limestone river, and held for me until required in the fall. I shipped supplies for the easterly end of the seventeenth base to Norway House, then took them with my own party to the beginning of the work.

During the latter part of October and until the freeze-up occurs, it is practically impossible to work in the bad swamps because standing all day in ice-cold water is beyond the limit of endurance. When winter sets in there is no more difficulty. Work in this district is both easier and more pleasant in winter than in summer. In the



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spring the party must disband for about two months because during the latter part of April and all of May dog teams cannot be used, and as the lakes are not yet free of ice canoes are useless.

For survey work during the winter only, horses and flat sleighs may be used to advantage for transportation, but a surveyor working all summer must use dog teams the following winter, or disband his party until about Christmas. As a general rule horses cannot be used until late in December, when the swamps are frozen, whereas dogs may be used in bush as soon as snow falls, and on the lakes as soon as they are frozen, generally about November 15. In making trail it is best to have several men walk ahead and return on snow-shoes, cutting what is necessary as they go. This will freeze at night and the next day the dog teams should be sent ahead loaded with heavy and compact supplies, the drivers wearing snow-shoes. This still further packs the snow which freezes at night leaving a good trail for moving the awkward high loads of camp equipage and dunnage. Before it is frozen, no one should be allowed on the trail without snow-shoes because the holes make hard work for the dogs.

Transportation by dog team is, under certain circumstances, the best method to use but it is always expensive. It requires one man to drive each team which haul about 400 pounds, often much less. On this basis freight moved along the line costs \$1.00 per 100 pounds per seven miles.

Fish is without doubt a splendid dog food as the northern dogs are accustomed to eating it, but it is very inconvenient for use by the base line surveyors. Five working dogs should be fed two fish each day or about thirty pounds, that is eight per cent of the load they can haul. The same dogs will eat ten pounds of dog biscuit per day, that is 2½ per cent of the load they can haul. No matter how carefully he may plan, the surveyor is never certain of getting all the fish he requires, whereas dog biscuit may be purchased from the wholesale firms and shipped to the line along with the rest of the cache. Dogs entirely unused to eating biscuits will soon relish them and keep in good condition. I have never seen biscuits fed to dogs that are making long hard trips every day, but believe they could be successfully used.

I have tried different methods of running line during the summer, but find the most successful is to move camp to the end of the work each morning, then cut line during the day and return to camp at night. In summer the men must be supplied with silk tents in order to lighten their loads. The comforts of life are few; the cook bakes without a stove, using frying pans, the men eat without dishes rather than pack the extra weight and everyone is continually wet, generally to the waist, because of wading through swamps. Man-packing is very laborious, but it the only method possible in the summer. The caches are placed on canoe routes near where the base will cross and the supplies packed along the line until the next route is reached.

Those accustomed to packing with horses have no idea how much of their camp equipage and personal effects may be dispensed with.

There is no comparison between the swamps in the western country where horses are used and those where surveyors attempt to use anything else than men for packing. Last season on the seventeenth base our party ran from Muningwari lake to the grade of the Hudson Bay railway, a distance of nineteen miles, and carried their camp equipment, dunnage and supplies over very bad swamps with no possible way of getting supplies in at any intermediate point. This will, perhaps show how great is the difficulty of summer work in this district.

The country along the fifteenth base from the principal meridian to Playgreen lake is a series of spruce and tamarack swamps with granite outcrops occurring about once or twice in each mile of line. The underlying rock is all granite and the swamps lie in the depressions. There is a small amount of spruce along the banks of McLaughlin river. The soil in most places is a black muck which is unsuited for farming. There are occasional clay ridges covered with poplar and birch, but these are too scattered and small to be of great value.



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The first four miles of the sixteenth base crosses bad tamarack and spruce swamps but near Nelson river the land is drier and covered with spruce, jackpine, birch and poplar. Along the west side of the river the line runs for about two miles through a brûlé ridge. From range 2 to Playgreen lake the country is spruce and tamarack swamp. Between Playgreen and Kiskittogisu lakes the line runs through a small belt of spruce six to twelve inches in diameter. Between the latter and Kiskitto lakes the country is swampy and covered with small spruce and tamarack.

For the first five miles west of Kiskitto lake the line runs through a mixture of spruce ridges and tamarack swamps; west of this the swamps are more extensive and the spruce occurs as knolls or islands in the swamp. For a short distance on each side of Minago river the country is burned and covered with deep windfall. From there to the beginning of range 14 it is almost all swamp. About the middle of range 14 the line runs through spruce and jackpine; a rock outcrop occurs there, the first after leaving Kiskitto lake. West of this the country is drier, the rock is limestone and the timber spruce, birch, poplar and jackpine.

Around the shore of Little Cormorant lake there is considerable limestone, which appears to be of good quality. The soil away from the rock ridges is clay and clay loam.

In the first two miles west of Cormorant lake the line runs over a limestone hill, covered with small jackpine and spruce. Ranges 24 and 25 are covered with spruce and tamarack with frequent jackpine ridges. Small lakes are numerous. In ranges 26 and 27, the line runs through a large amount of clay loam soil covered with spruce, poplar and birch. This is the best land seen along the three bases. It is distant from Pas about fifty miles.

East of Cross lake the seventeenth base runs through spruce swamp. The timber is of little value being the ordinary stunted growth generally seen in wet country. Near Cross lake on both sides and on the island crossed by the line, the underlying rock is granite, the soil clay loam and the timber spruce, birch and poplar from six to fourteen inches in diameter. West of the lake the country becomes softer and wetter and the timber gradually changes to the small spruce and tamarack of the swamps.

In range 9 near Lily lake and from there to Muningwari lake, in range 10, the soil is mostly clay loam and the timber spruce and poplar. On the west side of Muningwari lake extending for one mile east and west and nearly five miles north and south there is a belt of good spruce and jackpine from six to twenty inches in diameter. The soil is sandy, some of it being attracted by the magnet. The remainder of range 10 and ranges 11, 12 and 13 are very wet and covered with small spruce and tamarack. This is the same great swamp that is crossed by the sixteenth base in ranges 12 and 13. Through ranges 14 and 15 the line runs near Limestone river. There the soil is clay loam and the timber growing along both sides of the river is good spruce. In ranges 16, 17 and 18 the line runs through a vast spruce and tamarack swamp. Range 19 is drier being nearer Reed lake. As usual the timber also improves and near the shore good spruce grows from six to eighteen inches in diameter. The underlying rock is again granite and the soil clay loam. The rock at Norway House, Cross lake, Lily lake along Nelson and Muhigan rivers and also at Setting and Reed lakes is granite. The limestone area projects into this from the south.

At Norway House the settlers have small gardens and grow potatoes and some of the ordinary vegetables. One settler at the narrows of Cormorant lake has grown good potatoes and some of the resident engineers along the line of the Hudson Bay railway have small gardens with the ordinary vegetables. When circumstances warrant an extensive system of drainage I believe that some of this district can be used for farming.

Many of the swamps are soft and very difficult to cross in the summer, but nearly all have a hard bottom of clay, sand or rock. In mounding where the moss is thick, ice is frequently found at a depth of twelve inches throughout the summer.



Partridges, prairie-chickens, ptarmigan, rabbits, rats, mink, caribou, moose and bears are plentiful. In the district near Reed lake the work of beavers is seen along many of the rivers. Large numbers of whitefish, jackfish and some pickerel and gold-eye are found in all the lakes, and large trout in Namew lake. The Indians have no difficulty whatever in obtaining all the fresh meat and fish they require, and making a good living with their traps in winter. Trappers' cabins are numerous on all the lakes and rivers.

When the railway is completed the facilities for transportation will make the fishing industry profitable where now it is carried on only for dog feed in winter and for the local supply in the summer.

On almost all the rivers there are water-powers which will some day be valuable.

The original site of Norway House was on a point north of Warren's landing but many years ago it was moved to its present situation on Norway House island. This is the district office of the Hudson's Bay company for Keewatin district, and is the scene of great activity at times in the summer when freight is arriving or leaving. The Methodist mission is on the mainland northeast of the post; the Roman Catholic mission is on the east side of the island and the English mission is on an island immediately south. There is an Indian village near and many houses are scattered up and down the river.

The Northern Fish company run two boats from Selkirk to Warren's landing at the north end of lake Winnipeg in connection with their fishing operations and the Hudson's Bay company run a boat from there to Norway House. All freight for the district north of lake Winnipeg passes through Warren's landing. From Norway House the regular route to York Factory and intermediate points is via Nelson river, to Echimamish river, then through the lakes and rivers past Oxford House and down Hayes river. The Hudson's Bay company operates a small car on a wooden track over the portage on the Echimamish. The route down the Hayes instead of the Nelson is used because of the number of rapids on the latter. The route to Split lake and Nelson House is down the Nelson from Cross lake. Freight for Oxford House, Split lake and Nelson House is taken in York boats, that for Gods lake and Island lake is sent up Jack and McLaughlin rivers in canoes.

During the summers of 1912 and 1913, most of the freight for Cross Lake post and points north was shipped to Whiskey Jack by boat, then teamed across the portage and sent to Cross Lake post and points north in York boats.

Last summer the contractors for the Hudson Bay railway sent their freight from Warren's landing direct to Whiskey Jack, teamed it across the portage, and then shipped it over Cross lake in a barge towed by a gasoline launch. From there to Sipiwek lake, a distance of thirteen miles, they hauled it on a pole track, and then towed it in another barge across the lake. During the coming summer they will be able to take freight by this means as far north as Manitou rapids. From there to Split lake and points north it will be necessary to use canoes or York boats.

A small steamer runs from Pas up and down Saskatchewan river and across Moose lake to the narrows of Cormorant lake. The most used canoe route to the north from Pas is to Limestone bay on Moose lake, across the portage, ten miles to Limestone lake, then down Limestone river to Grass river and thence into Setting lake.

The Hudson Bay railway now under construction from Pas to Port Nelson crosses the sixteenth base in range 21 and the seventeenth base in range 13. When completed this road will alter and reverse many of the present freight routes into the north.

From Namew (Sturgeon) lake, there is a winter road out to Pas via Rock and Root lakes and the easterly side of Reader lake. This is used by teamsters in hauling fish from Namew and Rock lakes to Pas.



## APPENDIX No. 47.

## ABSTRACT OF THE REPORT OF G. P. J. ROY, D.L.S.

## SUBDIVISION IN EAST CENTRAL SASKATCHEWAN.

Our work for the season of 1913 lay mostly in the country bordering on the south limit of the Porcupine forest reserve in the eastern part of the province of Saskatchewan.

We left Tisdale on May 28 and on June 6 reached township 41, range 13 west of the second meridian where our first work was situated. On July 24 this survey was completed with the exception of the traverses which were left over for the winter.

The soil in this township is a heavy coat of yellow loam over a clay subsoil. The surface is a succession of light slopes and levels covered with areas of poplar two to five inches in diameter, interspersed with patches of brush and scrub. The principal topographical feature is Barrier lake, a long narrow body of water situated at the bottom of a valley from one hundred to one hundred and fifty feet deep. When cleared this district will be a good farming locality.

From July 25 to August 4 we were absent from our main camp running the boundaries of blocks 1 and 2 of timber berth No. 2055 situated in townships 42 and 43, range 11. We estimated these bluffs to be capable of producing nearly ten million feet of spruce. The spruce bluffs of the berth were surrounded by poplar woods interspersed with scrubby and open spaces. Red Deer river, a swift-flowing stream one hundred feet wide and four to ten feet deep, winds southeasterly through township 42, one bend of it being only half a mile from the south edge of the berth.

On August 5 we proceeded to township 39, range 9 west of the second meridian to survey the portion lying outside of the forest reserve. We found the soil good with large areas of open country interspersed with areas of timber, light poplar and willow brush and a number of small sloughs.

From there we moved to Kelvington where we camped, while the wagons drove to Wadena to haul in supplies coming from Winnipeg. Wadena is a prosperous new town on the branch of the Canadian Northern railway running from Winnipeg to Edmonton.

On September 2 we moved to the northeast corner of section 6, township 37, range 4 west of the second meridian and commenced the survey of the western part of the township. This township contains large sloughs mainly on sections 5, 7 and 8 and the low ground in the vicinity is covered with small poplar, willow and poplar brush, section 6, as well as the northern sections, is good level land, and is covered with a growth of poplar averaging two to three inches in diameter and scattered bluffs of spruce of little value except for homestead purposes. The southern sections are lightly wooded, and have some open spaces. Intending settlers were exploring them when we left.

The part of township 37, range 3 which we surveyed is similar to township 37, range 4, that is to say lightly rolling with the same kind of soil, but the bush is denser. We completed the work there on October 20.

There is a post-office two miles south of the centre of township 37, range 4, and Preeceville, the present terminus of the branch of the Canadian Northern railway running from Swan River, was within one day's travel from any of our camps. The location line of the proposed railway from Corona to Hudson Bay Junction crosses the same township.



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Leaving our camp there on October 21, we camped seven days later on the bush road opened along the east boundary of township 36, range 31, west of the principal meridian where our work consisted of the survey of part of this township, and the north and east boundaries of sections 19 to 24 in township 36, range 30. This work being completed we left for Bowsman on December 9.

Township 36, range 31 is thickly wooded, the only openings being a number of small hay sloughs. Part of the two northern tiers of sections and all of the southern part is a forest of poplar, some measuring up to seven inches, but most of it being from three to five inches in diameter with extensive windfall. Evidences remain of a bush fire which had passed many years ago. The soil is good and the surface slopes slightly to the south.

An old mill site is situated on section 34 in the middle of a well-timbered area which, although partly cut during recent years, is still capable of yielding at least ten million feet of good spruce.

The sections surveyed in township 36, range 30 are all wooded with poplar and scattered bluffs of spruce. The soil is good, the surface level, and there is an abundance of building material, fuel and water.

Benito, a progressive town in township 34, range 29, is the business centre of the vicinity. Arran is the nearest railway station but the village is small and there is no station agent.

The soil in the whole of this district is good and is suitable for all kinds of grain and root crops. With timber, fuel and good water in abundance, and roads good for travel even in their primitive state, it is one of the best sections for intending settlers.

All the small towns are growing fast and constitute a good market for all farm produce as well as for horses from the remaining but fast disappearing ranches.

On December 9, we closed operations for the season and left our camp on section 12, township 36, range 21, west of the principal meridian for Bowsman, where I stored the outfit, paid off the party and left for home.



## APPENDIX No. 48.

## ABSTRACT OF THE REPORT OF A. SAINT CYR, D.L.S.

## MERIDIAN AND BASE LINE SURVEYS IN NORTHERN SASKATCHEWAN.

My work for the season of 1913-14 consisted of the survey of the third meridian through townships 69 to 72 and the nineteenth base line west of the third meridian to the end of range 17.

I left Prince Albert, where my party was organized, on June 3, 1913, and arrived at "the forks" on the Montreal lake trail five days later. There I divided the party and instructed by first assistant to proceed to the eighteenth base line by the pack trail along the third meridian. Knowing that at many of the camping grounds along this trail the grass would be scanty, I advised him to take as many bags of oats as the horses could possibly carry, in addition to the men's outfit which had been reduced to the bare necessities. They took sufficient provisions to last them three weeks. With four men I proceeded to the Hudson's Bay company's trading post at the south end of Montreal lake, where I had already arranged to build a boat for the transport to the line, of our supplies stored at both ends of this lake. This mode of transportation was the only one possible at that season. The boat was substantially built, special care being given to the bottom. Its dimensions were thirty feet in length, but only eight and one-half feet in width. It had to be built narrow in order to run safely through the worst rapids where the channel is less than ten feet wide, and very tortuous in places. After the boat was built, I experienced some difficulty in securing an Indian crew, the best boatmen being at the time away from the village. Finally this matter was arranged by the agent of the Hudson's Bay company and on June 22 I made a start from the company's trading post at the south end of Montreal lake. The boat had been loaded with six and a half tons of material for the survey, and the crew consisted of four members of my survey party and several Indian canoeemen picked up at Montreal lake. Sailing up the lake, I reached the north end on June 25. Loading up two and a half tons more of camp supplies I then proceeded down Montreal river.

On July 1, we reached Montreal rapids where I received news of the main party who had just reached the eighteenth base line and were commencing the survey of the third meridian. They had met with many difficulties on the road owing to the flooded state of the country; the rebuilding of bridges, rebrushing of muskegs and the opening of new trails had considerably delayed their progress. I also learned that one man had quit the party shortly after the start had been made from "the forks" and that two of their ponies had taken sick and had been left behind near a small hay meadow, the packers intending to return for the ponies later on in the season.

At the "rapids" the packers loaded enough supplies to last the party until the big boat should have been brought to a point ahead of the line, whence a pack trail might be constructed along the nineteenth base line.

While going down the "Montreal rapids" a member of the Indian crew had the misfortune to meet with a serious accident and the rest becoming frightened at the difficulties met in navigating this river, decided to return with him to Montreal Lake Indian reserve. Accordingly I sent word to the Hudson's Bay company's agent at Montreal lake to despatch another crew of boatmen and to instruct them to pick up a small lot of supplies which had been left behind along the river banks, at Askik rapids.



Leaving Montreal rapids, we proceeded north to Sikachu lake which we reached on July 10. Here I spent some time exploring the country in the hope of locating a route passable for loaded pack ponies, but was unsuccessful, the soft and quaky nature of the ground and the extensive tracts of open bogs and treeless swamps upsetting all my plans in this respect.

My party was also experiencing great difficulties in their work and frequently had recourse to man-packing to move their camp outfit and supplies forward and the survey work that was daily carried on was due to the indomitable energy of the first assistant.

While waiting at Sikachu lake for the return of the Indian boatmen who had been sent back to Montreal rapids and Mountain rapids for some supplies that had been left at these places, I began a thorough exploration of the country northwest of the lake. Entering one of its west bays, I followed it two miles. At this distance it turns northwesterly. Noticing a gap through the hills along the west shore, I concluded that it must be the valley of a stream discharging into a bay. This proved to be Morin river which is from two to four chains wide and eight miles long. As the current was slack, we made good progress and soon came to Morin lake nearly five miles long and bearing west. This brought me within five miles of the third meridian but almost eighteen miles north of my party. However, another large stream was discovered flowing from the south into Morin lake and by ascending it five miles I came to Moose lake from which starts a portage leading to Smoothstone river. I returned to the big boat on Sikachu lake for more camp supplies and before leaving again for Moose lake I instructed the two men left in charge to overhaul all our provisions, some of which were in a fair way to spoil, and then to bring the boat to the west shore of Morin lake and there build a cache for our supplies. As the land west of this lake appeared to be fairly high I saw the possibility of opening later on, a pack trail between this cache and the line.

I returned to Moose lake in the old canvas canoe loaded with as many supplies as it could safely carry, and stored these on the west shore of this lake. Moose portage, which crosses the third meridian, begins here. Near this point I had previously left a note and sketch of the surrounding country (as we knew it then) for the explorer; it showed the location of this "cache" of supplies and advised my first assistant of my future whereabouts. On August 6, travelling westerly on Moose portage, I met seven of my men heading for the "cache" so we carried all the supplies to the first lake on the portage. These supplies were, the same night, brought to the main camp in the canvas canoe which one of my men had carried across the portage.

The northern Moose portage had been explored by me with the view of utilizing it for the transport of the supplies to Smoothstone river and thence to Snake lake, close to which we thought the nineteenth base line would run. If this could have been accomplished, it would have been of great assistance to us as my transport outfit was in a very reduced condition, no fewer than nine ponies having contracted swamp fever and an equal number being unfit for work through foot-rot. I was however unable to follow out this plan. Along Moose portage there are too many lakes surrounded by muskegs unfit for travel by horses, and no rafts could have been floated down Smoothstone river which, as we discovered later in the season, is a succession of rapids. Therefore, we frequently resorted to man-packing as our only means of transport.

The southern portage to Smoothstone river was, if possible, in a worse condition than the northern one, as it runs across a succession of quaky bogs and muskegs which do not become fit to travel over with dogs till frost has set in. The main party had up to this point been experiencing much difficulty from the wet country through which they were travelling and their horses were in very poor condition from lack of feed, the only grass obtainable being that growing in deep sloughs in which the horses had to stand in a considerable depth of water with the result that swamp fever and foot-





Bear in Jasper Park, Alberta.

Photo by H. Matheson, D.L.S.

This small black bear up a large Douglas-fir tree, near lake Annette in Jasper Park, is waiting for his lunch. Labourers constructing roads near by used to eat their mid-day lunches near this tree and feed scraps to the bear, so that he became quite tame.







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rot were prevalent and several animals had already succumbed. Up to that time all medicine given to them to counteract these ailments did not appear to produce the desired effect and no relief could reasonably be expected till the animals had been brought to a higher country.

From Moose portage the country along the line was drier and fairly good progress was made. When the line had reached as far north as Morin lake, seeing no prospect of getting farther west with the big boat, I transferred supplies contained in it to another "cache" which had been built about three miles from a lake close to which the meridian passes.

After some exploring on August 25, I left for Montreal lake to get my mail, hire more men and to arrange about the winter supplies. The members of my party who had helped in taking the boat down and in exploring this country, were sent back to join the main party. On September 6, the third meridian was completed.

Proceeding along the base line the nature of the country along the first ranges rendered a pack-road impossible and accordingly the horses were left near some fair feed at the south end of Lynx lake and the work was continued by means of canoe transportation and man-packing.

Several large lakes lying west of one another with quaky bogs between, were crossed by the first three ranges of the nineteenth base line and progress was very slow especially as the road even when located needed a great amount of corduroying and the building of several bridges before any freighting was practicable. Long detours had to be made to get past some bays of these lakes.

Returning from Prince Albert I rejoined the party on October 4 at section 35, township 72, range 2 and here found the head-packer to be very ill with what proved to be typhoid fever. I accordingly conveyed him to the Indian village on Egg river where there were some facilities for nursing him. To have tried to carry him to Lac la Ronge settlement at this season when snow storms were prevalent and the only accommodation for the night was a tent might have had very serious results.

The horses were now becoming fewer in number mostly from swamp fever contracted earlier in the summer, and which attacked them again while in an emaciated condition from lack of feed.

Returning from Lac la Ronge without obtaining my mail and with much difficulty as the freeze-up came very early, I rejoined my party on October 28, with a dog team and two Indians whose services had been secured by the manager of the Hudson's Bay company's trading post at Lac la Ronge.

Meanwhile the animals used by the main party were almost unable to work and several of them in their searches for feed became bogged in the partially frozen sloughs in spite of the vigilance of the packers, and died from exposure. Owing to this, the men had to carry everything on their backs and this delayed the progress of the survey considerably. I next started on the exploration of Besnard lake and Snake lake, with the timber cruiser and two men, since the two Indians wished to return to Lac la Ronge with their dogs. This exploration was necessary to find the lay of the country in the vicinity of the line and to locate and open a road for the freighters which were expected at an early date to bring some camp supplies, especially horse feed.

These men however failed us; they were very late in starting from Prince Albert where summer conditions were prevalent. They did not realize that in the northern part of the province winter had long before set in. Another reason for the delay was that they thought it absurd to use wagons and sleds on the same trip, this having never been attempted there. They spent so much time on the trip that on January 11, when they reached my camp in range 8, they had fed all my hay and part of the oats to their teams, so that not a particle of hay was left for our ponies at the most critical period of the year.



As soon as the ice became thick enough on the lakes near the line, we started to build sleds which were hauled by members of the party and in this manner the survey work was continued.

On November 16 we set to work building larger sleighs on which the men could pull a considerable load on the ice of the lakes while the horses were regaining strength; the small sleds were found too low to be of service except on absolutely bare ice. These large sleighs were afterwards used for a considerable time along the line, until we could obtain steel-shod factory-made ones.

West of range 3, the survey was carried on much more quickly, the frozen surface on the lakes assisting the transportation of supplies, etc., and such of the horses as remained got better feeding, now that the ice was solid enough everywhere to carry their weight. Still up to the close of operations in April 1914, although they were later on well looked after, they never fully recovered from the hardships they had endured in travelling across this country, and many more of them died.

I finished the exploration of Besnard and Snake lakes on December 9, and went to camp along our sled road near section 35 township 72 range 6.

There the party joined me on the following day using the horses to draw the sleighs over the ground for the first time.

On November 14, the explorer met with an accident that prevented him from doing his work, and the exploration of the country besides my other duties, devolved on me as no other member of the party cared to undertake it, one of their principal objections being the fear of meeting timber-wolves which had attacked the explorer on one of his trips across country and which are quite numerous in this locality.

Range 7 was completed and range 8 just begun by the end of the year. With the few bags of oats the teamsters from Prince Albert had brought to camp and others that I had obtained later from the mission at lac la Plonge, the remaining six ponies were kept alive for a time but two more died on February 10. To replace these I procured two oxen from lac la Plonge and with these six animals for transport the line was surveyed to range 18.

At the beginning of April the yoke of oxen had met with accidents; both of them had been snagged and our two smallest ponies were so weak that I saw the impossibility of continuing the survey of this line to the fourth meridian, I therefore decided to close operations and return to Prince Albert.

*General description of the country adjacent to the third meridian from township 68 to township 72 inclusive.*

The country traversed by the twenty-four miles of this meridian is somewhat varied in character.

In township 69 there is very little dry land; the country is flat, covered with stunted small trees, and short scrub, and was half flooded at the time of the survey. These wet lands extend several miles east of the meridian, but their drainage into Montreal river is largely prevented by a sandy ridge from fifty to one hundred feet high running northerly from Montreal portage to Partridge Coop lake. Where this ridge approaches the river it is at once noticed by the precipitous cut banks of stratified sand which form the left bank in several places.

In township 70 the country consists largely of spruce and tamarack swamps intersected by ridges of sand and gravel, timbered with jack pine of a diameter seldom over six inches. West of the meridian the low lands extend almost to Smoothstone river in townships 69 and 70, range 2, leaving along this stream only a narrow strip of dry land, varying from one-quarter of a mile to two miles in width and which is fairly well wooded with birch, poplar and jackpine from four to eight inches in diameter.

A stream which starts from a large lake in townships 68 and 69, range 26, west of the second meridian meanders for twelve miles in a northwesterly direction through



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this flat country. It is a tributary of Smoothstone river and connects several lakes. One of these is quite large and is found at one mile from the confluence of the two streams, near the centre of township 70, range 2.

In the country west of Smoothstone river the same conditions exist. Judging from the numerous brooks which discharge into the river from both sides, it seems that this wet country could be easily drained as the river is almost a continuous rapid, and the fall in a short distance of its course must therefore be very great. North of the eighteenth correction line the country becomes more rolling and township 71 contains some fair land which, although of a somewhat light soil, supports a good growth of large poplar.

In township 72, range 1, the ridges consist of granitic rocks and between these lie deep bogs, many of which are partly open. There is no hay in that section of country and except in township 71, very little grass for horse feed is to be found.

In township 70, there are several lakes; two of these, in sections 25 and 34, are on Moose portage which connects Moose lake four miles east of the meridian, with Smoothstone river in township 71, range 2. This portage is travelled every summer by the natives of Snake lake; it is fourteen miles long and follows a general north-westerly course. There are on it seven lakes from half a mile to two miles long. The two longest portages are two miles and two and one-half miles; the first one begins at the west shore of Moose lake, and the other one is adjacent to Smoothstone river, which at this point flows north across section 14, township 71, range 2. On this portage the height of land rises three miles east of the river and the drainage of many of the lakes found along the portage is carried by a swift-running but deep stream, which after a long circuitous course several miles north of the portage, returns southwards towards Moose lake where it discharges at a quarter of a mile only from the beginning of the portage. I ascended this stream several miles to the first rapids, but experienced great difficulty in paddling the canvas boat through the dense willow overhanging its low banks. I found this country covered with willow swamps intersected by low ridges of sand and gravel.

Lynx creek which flows out of Lynx lake in township 72, range 1, is another very crooked stream which presented the same difficulties, increased by occasional large boulders obstructing the narrow channel. It intersects the meridian in section 12 whence it winds through township 72, range 26, west of the second meridian and there enters Morin lake at the southeast corner of the same township.

In townships 70 and 71, ranges 25 and 26, west of the second meridian are many lakes, the largest one, named Morin lake, being five miles long from east to west. It lies in township 71, partly in ranges 25 and 26. Near its eastern extremity it has two large bays extending for several miles north and south.

Moose lake and Sanderson lake are both crossed by the eighteenth correction line. The first one is connected to Morin lake by a fairly large stream five miles long. The banks are very low and grassy and the current hardly noticeable. In Sanderson lake, which is east of Moose lake, there are several wooded islands; this lake drains eastward into Morin river, and a portage one hundred yards long connects the two lakes.

Morin river carries the water from the lake of the same name into the west bay of Sikachu lake. It is eight miles long, has a slack current and in two places expands into small lakes. The banks of this river are almost on a level with the water and the marshy country which adjoins it runs back a quarter mile or more to the foot of high hills timbered with jackpine, poplar and a few spruce.

Partridge Coop lake lies in the southeastern part of township 70, range 25, and drains east into Montreal river. By a portage two miles long, one can reach Sikachu lake and avoid the longer route by Montreal river. This portage passes through fairly level lands with woods of poplar six to ten inches in diameter. From the west end of Partridge Coop lake another portage leads to the valley of Smoothstone river. It bears almost west, is eighteen miles long and crosses a very wet country covered



with stunted trees and short scrub, except in the vicinity of the lake, where higher and fairly well timbered land exists. The Indians seldom travel over this portage before the frost has set in when it then becomes an ideal route to their hunting grounds. High dry land is found as a rule around all the above-mentioned lakes and the timber, consisting mostly of poplar and pine averages eight inches.

In the south half of townships 72, ranges 25 and 26, west of the second meridian no granite ledges were noticed. The country in general is level with occasional low ridges covered with small pine. It is drained by Lynx creek where several short rapids occur wherever it approaches the foot of the ridges. The elevation of its banks varies from three to six feet above the normal level of the water and at different places along it I saw some good hay land which could be improved by clearing it of the clumps of willow growing here and there on the grassy patches of land. By draining the wet sections of these hay meadows, they could be turned into fair pasturage.

The level country continues east into range 25 and extends south to the shores of a deep bay of Morin lake where another brook discharges. Farther north the land rises, but among the hills there appears to be a pass northwards towards the depression where Besnard lake, formerly known as Trout lake, is situated. The south shore of the latter lake is rock bound, and granite ledges, which rise up to forty feet, are found everywhere inland; between these are soft swamps and bogs. All the timber is stunted and of no commercial value.

The outlet of Besnard lake is at the northeastern corner of the lake and flows north to Churchill river. There are three rapids, two of which are avoided by portages. From the Indian village situated on the north side of the narrows of Besnard lake it takes a day and a half by canoe to go to Churchill river. The narrows are situated approximately in section 10, township 74, range 1. Here four or five families of Indians live, but although the soil in that vicinity is good, they do not raise any vegetables, being very different in that respect from their relatives living at Egg lake who, on the same kind of soil grow all the potatoes they require for their yearly consumption. The narrows are only one and one-half chains wide.

#### *Exploration of part of Smoothstone river and the adjacent country.*

Smoothstone river is with the exception of Beaver river, the largest stream intersected by my surveys. It empties into the south end of Snake lake as it is far from the ordinary routes leading north, this river and the adjoining country have very seldom been visited, except by Indian hunters. Therefore, with the intention of exploring this country I travelled a distance of forty-miles above the mouth of the river and reached the north boundary of township 69, range 2.

Such a journey if undertaken in the summer would have been very arduous owing to many long rapids which begin where the river crosses the north boundary of township 71, range 4. This work was made easy by the ice, over which I travelled quickly and with comparative safety. This allowed me to camp at points convenient for a fair examination of the country east and west of the river, to determine its possibilities as agricultural land and the value of its timber growth. The first camp was near the foot of the first rapids, fourteen miles above the estuary of the river. From this camp the exploratory line followed closely the north boundaries of townships 71, ranges 3 and 2, south of which the river flows in a general westerly direction and at distances varying from one mile and a half in the northeast part of township 71, range 2 to three miles in the northeastern part of township 71, range 3; thence its course is N. 60° W. to the foot of the rapids. This exploration shows that along this part of the river there is a strip nearly two miles and a half wide of good land wooded with poplar. This land has been burnt over and the trees of the second growth seldom reach six inches in diameter. Beyond this strip of good land are ridges with jackpine from two to ten inches in diameter. Back of the ridges tamarack and spruce swamps were crossed in which the timber is of no commercial value. At two places along the



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river banks I noticed some small clumps of spruce where a few of the trees ran up to thirty inches in diameter.

The benches along the right bank of the river often rise to fifty feet but where flats occur the banks of the river are from four to six feet high. The soil of the flats is always good as shown by the larger trees growing in such places. The width of Smoothstone river varies much. Across some of the rapids it is less than one chain and a half, while at other places it is from four to six chains wide. Its bottom is stony and the depth of the water is eight feet in many places.

The second camp was approximately in section 23, township 71, range 3, which Smoothstone river crosses from east to west. In this vicinity there are along the river some narrow flats with poplar, spruce and birch, amongst which grow thick underbrush. The benches which rise at a short distance from the river are fifty to seventy feet high and covered with second-growth poplar and jackpine. At three miles west of the river there is a lake two miles long. A dense growth of small spruce is found around this lake and it continues west another mile where a strip of good land, two miles wide lies. Ridges of jackpine and poplar divide this land from the valley of a small creek which joins the river at one mile above the first rapids. The exploration line crosses this creek at six miles from its junction with the river; at the crossing the valley is ten chains wide and covered with thick willow but beyond the creek the surface of the country is rolling. A short distance above the confluence I crossed a narrow belt of fair timber consisting of spruce from eight to fifteen inches and jackpine and balsam from six to ten inches in diameter. There is some bad windfall in this vicinity. The river benches rise to one hundred feet.

The next exploration line ran in a southwesterly direction from section 13, township 71, range 2, where Moose portage ends. Two miles and a half below it is one of the worst rapids seen on Smoothstone river. It can, however, be avoided by packing over a portage half a mile long which passes across a flat covered with scrubby birch and spruce. The country through which Moose portage passes may be described as rolling. Near one of the lakes in the middle of the portage there is a patch of spruce from ten to eighteen inches in diameter, but the timber consists mostly of jackpine from six to twelve inches; poplar running up to ten inches cover large areas. North of the portage a forest fire was still burning through the second growth of trees found there. The more level and best wooded lands are generally near the lakes, around which the soil is fair, but I did not see any hay meadows as the valleys of all the streams connecting these lakes were everywhere covered with dense willow and alder. At half a mile above the point where Moose portage reaches Smoothstone river, the high benches, which from the first rapids were a prominent feature along its banks, gradually recede from the river, leaving long stretches that are covered with willow and swamps. There are many small islands in that part of the river.

The timber cruiser who explored townships 71 and part of 70, range 2, reports crossing, after leaving the river, a strip of land two miles wide and timbered with poplar and spruce; the country farther west he describes as rolling and covered with jackpine and small spruce. The same day I travelled nine miles by the river as far as the confluence of a large brook which flows from a southeasterly direction. Here I noticed a dog trail and as the ice on the river was unsafe, I decided to follow this trail over which I could make good progress. From Smoothstone river it runs S. 20° W. for four miles and crosses a flat country sometimes covered with short scrub. At many places it is open and grassy. It extends east beyond the third meridian; a few knolls only rise from this flat swampy expanse, one lies west of the trail and another one is close to the north shore of a lake, two miles long and one mile wide. The valley of the river is not more than two miles west of the trail and is defined by low ridges wooded with pine and poplar. After crossing the lake the general direction of the dog trail is south and west and the distance to Smoothstone river is four miles, most of it through spruce swamp and a few open bogs with narrow ridges across. When within



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one-third of a mile from where it again strikes the river it enters a belt of jackpine and poplar from four to six inches in diameter. I was quite surprised to find that at this point Smoothstone river was entirely free from ice. It is about three chains wide; its right bank is fifty feet high, but the other bank is low, grassy and covered with willow and the country back of it appears to be swampy. A branch of the trail which I had followed in going to Smoothstone river leaves the main trail at two miles and a half north of the small lake mentioned above. It runs almost east and intersects the third meridian at the corner of section 1, township 69. This dog-trail evidently ends at Partridge Coop lake. We then went to section 30, township 70, range 1 where we found a newly-built Indian hut, and as there was no one living in it we took possession for the night. This shack is on the right-hand side of the river, and stands in a flat where spruce and jackpine from four to eight inches grow. Smoothstone river here is six chains wide and for three miles north is free from rapids. There are grassy marshes along the left bank.

The country west of the river in township 70, is fairly high for a quarter of a mile or so, but this narrow strip of dry land comes to an end a few miles farther on where the swamp back of it comes to the river. The water in the numerous brooks which rise in these swamps tastes strongly of iron.

On Smoothstone river large water-powers could be developed.

#### *General remarks.*

During my surveys I saw very little land at present suitable for settlement along the third meridian and for a considerable distance west of it. The sections of country at present fit for agriculture are very sparsely distributed in this region. The arable land consists of clay loam and is generally found in proximity to some of the largest lakes and in the valleys of the principal streams. Hay lands are also very scarce through all this district. Whenever seen they were always submerged and in most cases would be hard to reclaim, being so little above the level of the lakes and streams. Moreover these grassy stretches are more in the form of bogs than regular hay meadows. The country improves to a certain extent west of Beaver river both in the quality of the soil and also the growth of timber, which is much better in size and quantity.

At places where the land has been tilled, the crops have proved satisfactory and have never been seriously damaged by summer frosts. The principal revenue of the country is still derived from the fur trade to which has been added in recent years the produce from the yearly increasing fishing industries. The I. C. Fish Co., which is the pioneer in this province, intends to establish new fisheries and in connection with this industry have this spring erected a saw-mill at Ile-a-la-Crosse settlement. They will now be able to manufacture their own boxes of which several thousands are required, and which up to the present date have had to be brought in by teams.

All the lakes in the district are well stocked with the best species of fish including trout and whitefish. There are also quantities of pike, pickerel, carp, etc.

Water-power could be developed on Montreal river as the drop in the whole course of this stream is 350 feet, whilst at Montreal rapids which are about eight miles long the fall is 105 feet. Farther down stream at Mountain rapids the drop in two miles and a half is 40 feet.

Large game such as moose, caribou and deer, is plentiful. In one herd which I saw east of lac la Plonge I counted twenty-three head. As might naturally be surmised the predatory animals, such as timber-wolves infest this country. Of the fur-bearing animals, bears, lynx, marten, mink, coyotes, foxes and otter are often seen. The ubiquitous muskrat is still there in great numbers. Of beaver, traces only of their work were noticed on Tippo river.

No minerals were found but quarries of building stones could be opened in the granite ledges seen south of Besnard lake.



## APPENDIX No. 49.

## ABSTRACT OF THE REPORT OF J. B. SAINT CYR, D.L.S.

## STADIA SURVEYS IN THE VICINITY OF RED DEER, ALBERTA.

My party was organized at Edmonton, and on May 14, 1913, I left for Gull lake the scene of my first work which consisted of the survey of this lake and of those in the surrounding townships.

At the south end of Gull lake which is situated in township 40, range 28 west of the fourth meridian a great number of cottages have lately been built. It is a fine summer resort, and hundreds of people from Edmonton, Red Deer, Lacombe, Ponoka and other places spend a part of the summer there. The lake is deep, contains clear soft water, and is well stocked with pike and pickerel. Wiseville which is south of the lake is the principal village in that township. The greater part of the village is situated on section 22. All that country situated between the Blindman valley to the west of Gull lake and Lacombe and Ponoka to the east is good farming country. The surface is half prairie and half bush and is hilly and rolling. Oats are grown in that district in larger quantities than wheat. In the gardens all kinds of vegetables are grown successfully. The farmers also raise hogs and horses on a large scale.

After leaving the vicinity of Gull lake we travelled from township to township throughout the district lying east and southeast of Red Deer, traversing all the lakes which were large enough and deep enough to warrant it. During the season fifty-four townships were visited and investigated and hundreds of lakes were traversed.

In all the townships in which we worked the country is more or less open. Wheat is grown in larger quantities through the eastern part of this district than in the western part. In nearly every locality where I travelled during the summer of 1913, mixed farming was carried on by all the farmers. Every settler praises the country highly for its great agricultural possibilities. The fall was remarkably dry and mild, the sun shining almost every day for several weeks. The coldest period experienced in December was ten degrees below zero, for four or five days.

On January 6, 1914, I returned to Edmonton after eight months in the field having moved camp about fifty times and travelled over a thousand miles.



## APPENDIX No. 50.

## ABSTRACT OF THE REPORT OF B. H. SEGRE, D.L.S.

## STADIA SURVEYS IN THE REGINA DISTRICT.

My work for the season of 1913 consisted of the investigation and traverse of lakes in townships north and west of Regina.

My first work was in township 17, range 22, west of the second meridian. This township is all gently undulating prairie and the lakes and marshes have either entirely dried up, or dry up in the fall of each year. The large lake formerly in section 17 of this township has completely dried up and now provides excellent grazing land for stock. To the west the country becomes more rolling towards Moosejaw creek, the valley of which is nearly 250 feet below the level of the surrounding area; west of this creek the prairie becomes less broken and no marshes were noticed.

Northerly towards township 20, range 22, the country becomes more and more rolling and there are many marshes and sloughs which contain only the surplus water of the spring and which dry up in autumn. Many alkaline lakes were found in this township, lying in valleys about fifty feet deep; these lakes are shallow and contain strongly saline water, but they are fed by springs and will be permanent.

From this township I proceeded to township 18, range 24. I found that the majority of the lakes in the township had changed very little since the original survey. Rocky lake was about six feet deep in places and its water was slightly alkaline, the surrounding country is rolling prairie becoming more and more broken to the west in range 25.

My next work was the survey of Buffalo Pound lake in townships 18, 19 and 20, ranges 25 and 26. This lake lies in a valley, the banks of which rise 300 feet above water level. The shores are marshy for the most part, and long reeds fringe them for a distance of from five to ten chains from the high-water mark; this feature is no doubt due to the shallowness of the lake, the greatest depth being eight feet. The maximum depth is reached about ten chains from shore on both sides, thus revealing a very uniform bed in the centre of the lake. A small creek enters the lake at the north end, and this together with numerous springs constitute its source of supply. It is drained through Qu'Appelle river at the south end. The slopes of the valley are covered with a dense growth of poplar and willow scrub. An abundance of grass furnishes ample pasture for stock.

This lake seems to be the dividing line between two different types of country.

The land above the valley on the west side is gently undulating prairie with good sandy loam, free from stones, while that part lying on the east side of the lake is very hilly and rolling and the soil is freely intermixed with granite boulders, requiring more expense in carrying on farming operations.

This seeming disadvantage however, is more than offset by the fact that farmers living above the valley on the west side, find great difficulty in securing water. It can be obtained only at great depths and even then it is of very inferior quality. Those on the east side on the other hand get an abundance of good water near the surface.

The water of this lake is very alkaline which no doubt accounts for the fact that there are no fish in it, although many fish are caught in Moosejaw creek which joins Qu'Appelle river just east of the lake.

Having completed the traverse of Buffalo Pound lake, my next work consisted of the investigation of small lakes and marshes in township 21, range 26. The country



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around these lakes is very hilly prairie, and no doubt the lakes are formed from the surplus run-off of the surrounding area. No large creeks or springs were found which could be called a source of supply, yet the lakes seemed permanent and no change in the high water mark could be noticed.

From there we moved camp to township 22, range 27, and surveyed a lake near Aylesbury. The water of this lake is slightly alkaline and lies in a valley, the banks of which rise from 50 to 100 feet above water level. There are numerous small springs along the sides which constitute the source of supply, and a small creek at the south end apparently drains the lake. The greatest depth is about ten feet. There are no fish in this lake.

From this township I crossed the valley of Arm river and after making an investigation in township 26, range 27, I moved camp to township 26, range 25. Here my work consisted in traversing a large lake near the town of Stalwart. This lake is nothing more than a large marsh filled with alkaline water, three feet being its greatest depth; the greater portion of the lake is covered by reeds. A small creek enters from the northwest forming the only visible source of supply and another small creek drains it to the southwest; this creek eventually enters an arm of Last Mountain lake. On account of the amount of weeds growing in this lake, it is the resort of a great number of ducks and other water-fowl, which nest along its banks. A number of marshes were also investigated and traversed in this township; they were all shallow and distinctly alkaline in taste. A few alkaline flats lie in the western part of this township, rendering many hundreds of acres useless for grain growing purposes. The country between this township and Last Mountain lake is gently rolling prairie; but west of this, the ground becomes more and more broken and covered by boulders. Very little road-building has been done in this township on account of the number of sloughs to be crossed. This hampers the farmer very much in the speedy transport of his grain to the railway.

We next moved camp to township 27, range 24, and investigated many small marshes in this township and also in township 28. There the country is not as hilly as is usual in this district and the majority of the marshes, having dried up, produce excellent hay. In many instances the former beds of marshes have been ploughed up and are producing grain.

Bullrush lake in township 28, range 25, was traversed from this camp. This lake resembles a large marsh, the greatest depth of water being three feet, and a thick growth of grass covering the entire bed. The water has receded in many cases and parts of the former bed are now being utilized for hay growing. There are unmistakable signs that this lake has dried up before, as old haystacks were seen in the centre of the area now covered by water, and the marks of the plough were noticed, the old furrows being now under water; the bed of the lake, however, being the natural receptacle for the run-off of a large area, is liable to flooding in wet years.

From this camp I commenced the survey of Last Mountain lake, the largest body of really fresh water in central Saskatchewan. The north end of this lake consists of three long arms, into which flow as many creeks, while along the shore numerous springs and creeks enter. These drain a very large area, and maintain the lake at an almost constant level. Soundings were taken in the north end amongst the many islands, and the greatest depth recorded was ten feet. Farther south, however, the depth increased, and from information obtained from the captain of the steamer which plies up and down the lake, I was led to believe that the greatest depth is near the southern end and is about one hundred and thirty feet.

There are numerous summer resorts along this lake, the most important being Regina beach and Saskatchewan beach, the former on the west shore, and the latter on the east shore, both served by the Canadian Pacific railway from Regina and Saskatoon. The lake provides excellent fishing during the summer; pike, pickerel and whitefish being caught in abundance. A few fishermen make a living by summer fishing,



but in winter operations are carried on more extensively, about one hundred men being engaged in this occupation. The fish finds a ready market in Regina.

At the north end the shores of the lake are more or less marshy with low banks, but as we worked south along the west shore, the banks commenced to rise abruptly from the water's edge, in township 22. These banks became gradually steeper until township 21 was reached where the valley is about 250 feet deep and stretches back for a distance of from twenty to forty chains from the water's edge. Commencing in township 22 vegetation is to be found along the shores, which are for the most part sandy. Groves of ash and willow which extend to the water's edge, delayed traversing considerably in the summer; it was therefore found advisable to cease operations for the time being, when the north boundary of township 21, range 22, was reached. A return was made to the lake when the ice formed and the traverse of the west shore was completed, as well as the east shore south of township 25, range 24.

The largest body of water entering the lake is Arm river which forms a long estuary running nearly two miles from the main body of the lake. This lake is drained by a river which flows through a large marsh at the southeast end, finally joining Qu'Appelle river. During the traverse of this lake numerous investigations were carried on in the townships passed through, the majority being of shallow marshes and lakes, the water of which was alkaline, and the shores of which were covered with reeds and marsh grass. A few of these marshes have dried up and are producing hay, but the most of them contained water all through the past season. The country on the west side of Last Mountain lake is gently rolling prairie at the north end, and becomes more hilly and broken toward the south, township 21 being very rough and containing many small lakes. The water in these lakes was for the most part slightly alkaline, but wherever it was found to be not too salty, it was of great use to the farmers, providing drinking water for the stock in many districts where the obtaining of a large quantity of water is a serious problem.

After leaving the traverse of the west shore of Last Mountain lake, investigations were carried on in townships 20 and 21, range 21. A few small lakes were found which were shallow but evidently permanent. The marshes in these townships have dried up considerably, but being low spots in scrubby country are likely to hold the snow and contain water in early spring. The valley of Qu'Appelle river divides the topography of the country, the south side of the valley being gently undulating prairie, and the north side being rolling country covered by poplar and willow bluffs. In the river valley there is excellent pasture land, and it is an ideal spot for stock-raising.

Camp was next moved to township 23, range 19 where further investigations were carried on. This district is mostly rolling prairie with many shallow sloughs, quite a number of which have dried up and are now producing hay.

From there camp was moved to township 25, range 19 and once more rough rolling country was encountered.

A branch of Loon creek flows through the eastern part of this township and provides drainage for a large area. The valley of this creek is from fifty to seventy-five feet deep, and is covered with thick bluffs of poplar and willow in the southeastern end of the township. There are also several marshes in the creek valley. Three lakes traversed in sections 22 and 27 were found to be permanent, they lie in a valley from twenty to thirty feet deep and apparently receive the drainage of a large area in the northeastern part of the township. Most of the small marshes investigated are now dry and are used for growing hay. A large lake in township 26, range 19, was traversed and found to be permanent but the marshes in this township have all dried up and produce hay.

Our next camp was in township 25, range 22. All the lakes examined in this township were strongly alkaline, and are drying up: in section 29, the greater part of the former bed of the lake is now dry and producing hay. The country is very rolling



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in this township becoming more and more broken until Last mountain is reached in range 21, where the hills rise abruptly from 300 to 500 feet and are cut by deep valleys, which at present greatly impede traffic from the East. One large marsh at the north-east corner of this township lies at the base of Last mountain. This marsh does not exceed one and a half feet in depth, and is almost completely covered by a thick growth of reeds and marsh grass; however, it receives the drainage of a very large area, and will be permanent, although its shores may be subject to wide variations according to the season. To the south of this township many alkaline lakes were traversed, they were all shallow, but they will likely all be permanent. The country is rough rolling prairie, and there are no creeks to drain these lakes. A number of marshes were investigated in this township and also to the west; the majority appear to be drying up and are being used to produce hay.

From there, camp was again moved to Last Mountain lake in township 25, range 24, and the traverse of the east shore commenced by running south from the north boundary of the township. The shore line in the northern part of township 25 is marshy, but farther south it is—for the most part sandy with banks rising from three to ten feet high from the water's edge. In township 23 the banks become steeper and more abrupt, until township 21 is reached where the valley is 250 feet deep and similar to the valley on the western shore; being covered by poplar and willow scrub and a good growth of grass affording good pasture for stock. This lake becomes gradually more shallow as the south end is reached, and at the point where the Canadian Pacific railway grade crosses it the maximum depth is three and a half feet. South of this grade there is a great change in the lake as the open water gives place to a large marsh covered by reeds and marsh grass with water one to three feet deep. The creek which drains the lake meanders through this marsh finally joining Qu'Appelle river at Craven. The land covered by the waters of the marsh is more or less useless except for water-fowl, but a strip of low land about five chains wide and one foot above water level extend along both banks of the creek and may provide pasture. On completion of this work, I made a traverse of that part of the lake in section 30, township 28, range 23. I then returned to Regina and disbanded my party.



## APPENDIX No. 51.

## ABSTRACT OF THE REPORT OF F. V. SEIBERT, D.L.S.

## SURVEY OF THE TWENTY-FIRST BASE LINE FROM THE FOURTH TO THE FIFTH MERIDIAN.

To survey the twenty-first base line it was necessary to have supplies placed near the latitude of the line and west of the fourth meridian, yet close enough to the latter to be within easy reach of the starting point of the line. With this in view my assistant left Edmonton on February 12, 1913 to build a cache on Christina river near where the line would cross and to clear the old trails and cut new ones where necessary. His route led by way of Athabaska and Lac LaBiche settlements, thence over the wagon road to Heart lake, and from there northerly to Wappau lake over the sleigh trail used by Mr. G. McMillan, D.L.S. in placing supplies for the twentieth base. From Wappau lake he expected to go down May river to Christina river and then along this river to the latitude of the line. When he reached May river, however he found that the deep snow had kept the river from freezing over in many places, necessitating more cutting than he had expected. He therefore decided to build a cache at the northerly end of Wappau lake, return to Lac LaBiche to report and have the freight sent on to the cache, and then report to me at Edmonton. He arrived at Edmonton March 11.

The following day my party left for the work, going by the Canadian Northern railway to Athabaska and thence by teams and sleighs to Lac LaBiche. When we arrived there on March 20 we found that the deep snow with the heavy crust had retarded the forwarding of freight; the larger part of the supplies were still at Lac LaBiche and the remainder had been taken about twenty miles north of Heart lake where they had been left by the freighters when their teams became exhausted.

We left Lac LaBiche on March 21 with eight teams and ten of our best pack horses, leaving the remainder there. We took nearly all the camp supplies with us and before leaving we made arrangements for more teams to follow with the remainder and sufficient hay and oats to take us to our destination.

At noon March 24 we reached the cache made by the freighters on their first trip. Up to this point it was easy travelling as the trail was broken but from there on travelling was very slow and extremely hard on the horses, as their legs soon became seriously cut by the crust, and they showed signs of playing out. We procured four sets of double harness and one set of sleighs left by Mr. Blanchet, D.L.S. on the nineteenth base line and made use of the flat sleigh we had with us. I also decided to relieve the horses to some extent by having my men break down the crust ahead of the teams. On March 28, we reached the cache built by Mr. Logan and after resting there one day, we proceeded down May river, cutting out portages where necessary. We reached Christina river on March 30.

Our supply of hay and oats was low, so I decided to return with one of my teams and all the hired teams to meet the teams coming in with more. We returned to Christina river on April 4, and my hired teams stayed with me one day more taking us about twelve miles down the river. From there I allowed them to return to Lac LaBiche. We then moved camp and supplies about twelve miles farther down the river to the crossing of the McMurray summer pack trail, getting everything there by April 15. We used the sleighs on the river for the last time on the 11th and then packed what was left over land.

In April 19 the packponies we had left at Lac LaBiche arrived and we at once started to pack to the latitude of our line cutting our trail as we went and following



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the east bank of the Christina. We took only the necessary supplies and outfit, and made a cache of the remainder. When we were about four miles south of the latitude of the twenty-first base line we struck an old trail running easterly which was part of the trail running from Winefred lake to McMurray. We opened up this trail as far as Cowpar lake and from there cut trail easterly to the fourth meridian pack trail on Landels river. We reached the starting point of our line on May 3 and commenced our survey on the 5th.

The supplies we took with us to the meridian lasted until we ran the line as far as the summer pack trail between Lac LaBiche and McMurray, which we reached on June 1. We were then in touch with the cache we had made in April on Christina river, which was two days' travel by pack train south of the line. During our absence this cache had been broken into and about nine hundred pounds of supplies taken, as well as a quantity of clothing belonging to myself and men. Fortunately we had still enough supplies but my men were short of the necessary clothing.

Large areas of muskeg exist in the country traversed by the twenty-first base line between the fourth meridian and Athabaska river, but nearly all of this can be easily drained. The river valleys have in most cases good land. Beginning at the fourth meridian and going west good land is to be found along Landels and Winefred rivers as well as around Cowpar lake. At the latter place a few Indian families make their permanent home. Where the line crosses it Christina river has a low valley which extends either way for about twelve miles. In some places this valley is low and wet but it could be easily drained. The land close to the river is excellent, becoming lighter, however, the farther it is from the river. The strip of land between the Little Rocky mountains and the Christina is mostly of excellent quality.

The Little Rocky mountains in ranges 6 and 7 make a distinct break in the country. They rise rather abruptly from the rolling country bordering on the Christina to a plateau composed chiefly of muskeg and sandy rocky ridges. They are more pronounced to the north running off into low hills to the south. The same formation appears in ranges 12 and 13 with the drop towards the west instead of the east as in ranges 6 and 7. They are also more pronounced to the north and barely noticeable to the south. Ranges 13, 14 and 15 contain large areas of muskeg with ridges, running northerly which to a large extent prevent the drainage from taking its natural course westward. These ridges are very little higher than the muskegs which border them on the east, but they have a decided slope to the west and give the country the appearance of being composed of a series of plateaus with a general fall to the west.

House river in range 16 has a valley which is from three hundred to three hundred and fifty feet deep. The river can be navigated with canoes a greater part of its length. Patches of large spruce are still preserved in the valley but a much larger area has been destroyed by fire.

The strip of land between House and Athabaska rivers is mostly muskeg which could be very easily drained to the deep valleys on either side.

The Athabaska which is crossed by the line in range 17 has a valley from two to three miles wide and averaging about four hundred feet deep. Here also a great deal of large spruce has been destroyed by fire, but much still remains. A fire ranger with headquarters at Pelican portage patrols the river, working in conjunction with the fire patrol boat which has its headquarters at Athabaska, and much of the waste by fire will no doubt be prevented.

Drilling has been done at Pelican portage and gas has been found in each of the four wells drilled.

On the west side of the Athabaska muskeg extends for many miles westward. This muskeg extends north as far as the correction line and south to Pelican river which flows into the Athabaska from the west. On account of the very wet summer this muskeg was impassable; and it was therefore necessary to leave this part of the line till winter.



Accordingly we left the line on September 29 and tracked up the river with a scow and canoe, arriving at Athabaska on October 7 and at Edmonton on the 9th.

We left Edmonton again by the Canadian Northern railway for Athabaska on January 2, 1914 and reached there the same day. There we met four of my teams which I had sent overland by trail from Edmonton. We left Athabaska on the 5th, and following down Athabaska river, reached Pelican portage on the 10th. We rested the horses there a day, and then continued down the river reaching the crossing of the line in two days. In making the trip to this place we broke trail most of the way from Athabaska, but experienced no serious difficulty until we were within about ten miles of Pelican portage. From there we encountered rough ice most of the way to the line. At Pelican rapids the ice was in some places piled ten feet high, and it required considerable cutting to get a trail through it. With the party ahead of the teams cutting down the ice the delay was slight. Two days cutting trail from the river took us up over the edge of the valley to the centre of range 18 where we had left the line in September.

We started the line on January 16, and made good progress with its production, reaching the fifth meridian on February 23.

We cached our main stock of supplies at the river and forwarded them along the line on bob-sleighs at the river using four teams from my pack outfit for the purpose.

The country from the banks of Athabaska river about the east boundary of range 18 to the east boundary of section 32, range 23, a distance of thirty-four miles, is mostly muskeg. To the south this muskeg extends to Pelican river which follows roughly the twentieth correction line, and to the north it extends beyond the twenty-first correction line. Muskeg creek in range 20 is too small to be used by canoes, and the only way to cross this country is over the frozen muskeg. The tamarack in some parts of the muskeg and the jackpine on some small islands of sandy land is large enough for railway ties, but ninety per cent of this area is covered with timber too small for use.

West of the east boundary of section 32, range 23, the character of the country changes entirely, the surface becoming rolling. Very little muskeg exists, and some good spruce and poplar is still preserved. There is not enough timber in any one place for a timber berth, but there is sufficient for the needs of settlers. The land is good.

The line crosses north Wabiskaw lake in ranges 25 and 26. South Wabiskaw lake is about four miles south of the line in ranges 24 and 25, and Sandy lake is situated in township 79, range 23. All of these lakes contain whitefish.

The settlement of Wabiskaw lies at the southeast corner of north Wabiskaw lake. To reach it there is a choice of two trails in winter and three in summer. One of the winter trails crosses from south Wabiskaw lake over Pelican mountains to Rock Island lake, then to Calling lake, and from there to a point on Athabaska river, twelve miles from Athabaska. Another branch of the same trail leads from Calling lake to a point on Athabaska river, called the "fish camp," about seventy miles up the river from Athabaska. This branch of the trail is not used much now. There are some bad hills going over the Pelican mountains, and another leaving Athabaska river. The trip from Athabaska to Wabiskaw by this trail can be made, with moderate loads and good weather, in five days. The other winter trail is by way of Sandy lake, Pelican lake, Pelican river, and Athabaska river to Athabaska. This is a very much longer route, but has the advantage of having only one hill, which is at Athabaska river. The regular winter freight rate from Athabaska to Wabiskaw is two and a half cents per pound. In summer there is a canoe route by way of Sandy lake, Pelican lake and river, and Athabaska river. Two pack trails can be used in summer to reach this post, one by way of Calling lake, and Rock Island lake, and the other by way of Sawridge on Lesser Slave river. The latter I am told is much the better trail and is cut out for wagons part of the way.

No indications of minerals were noticed during the season.



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## APPENDIX No. 52.

## REPORT OF N. C. STEWART, D.L.S.

SURVEYS IN THE RAILWAY BELT OF BRITISH COLUMBIA.

VANCOUVER, B. C., January 28, 1914.

E. DEVILLE, ESQ., LL.D.,

Surveyor General,

Ottawa, Canada.

SIR,—I have the honour to submit the following report of my season's operations in the railway belt in the province of British Columbia.

After organizing my party at Revelstoke I left for township 20, range 9, west of the sixth meridian where my first work was located. I arrived there on May 8 and pitched my first camp beside the new automobile road which was being constructed between Salmon Arm and Enderby. I surveyed the east boundaries of sections 4 and 9 and moved camp by wagon along the road to Enderby about six miles, then taking a branch road which leads around Sugarloaf mountain I was able to get my outfit to the southeast quarter of section 35, township 19, range 9. The road around the mountain was very rough and steep and I required two teams to haul my outfit over it. Several fine farms surround the mountain and others were being taken up on the bench land which extends northward from this mountain for nearly three miles. I surveyed the east boundaries of sections 2 and 11 and the north boundaries of sections 1 and 12, in township 20, range 9, thus opening all that bench land for settlement. The soil is generally a light sandy loam and very stony. A muskeg about eighty acres in extent, known locally as "Mara Meadows," was found in section 12: this will need considerable drainage before it will produce hay. Marketable timber was found in parts of sections 1, 12 and 13.

On May 28 we moved to Grindrod, the nearest railway station, and took train to Chase. The following day we crossed Little Shuswap lake on the Adams River Lumber company's launch and teams were hired to take the outfit to Adams lake which was reached rather late that night. The road between the two lakes is very steep in places ascending a mountain and then descending again although I believe the difference of level between the lakes is only 150 feet. On May 30 with the aid of a small steamer and a scow we arrived at section 28, township 25, range 12. All the land in this township north of Adams lake including four miles of the north limit of the railway belt was surveyed. I triangulated across the lake on the east boundaries of sections 28 and 21, traversed a few miles of the southeast shore of the lake and ran sufficient lines to survey all the land likely to be required for agricultural purposes in the township. While there we experienced very wet weather and several severe storms.

The next work was in township 24, range 13, west of the sixth meridian. Here I again triangulated Adams lake from a post found on the north boundary of section 27 to a point on the north boundary of section 26. The land in sections 35 and 26 and the northeast quarter of section 23 was surveyed. This part of the lake which is opposite to Agate bay (known locally as "Squam bay") is said to be the only part of the lake free from ice in the winter.

My next move was across Adams lake to Pass creek and then by wagon road to section 1, township 25, range 14, west of the sixth meridian. There I ran the north boundary of the section which is also the north limit of the railway belt. This



line ran along the side of an almost perpendicular mountain which rises about 2,500 feet above the valley. I also attempted to retrace the boundaries of the Homestake group of mineral claims which are located in this section, but most of the monuments of the original survey had disappeared.

Adams lake is more interesting from a scenic and geological than from a settler's standpoint, as there is very little agricultural land near it, its shores being generally perpendicular cliffs. The lake is subject to sudden and violent wind storms making it dangerous for small boats and canoes.

The surveys in the vicinity of Adams lake were completed on July 17, and on July 19 camp was pitched beside Columbia river near the south boundary of section 14, township 23, range 18, west of the fifth meridian, a move of nearly 250 miles, requiring eight changes of conveyances.

My work in this locality consisted of running the south limit of the railway belt from the Columbia valley over the Beaverfoot range, and across the Kootenay valley. The Beaverfoot mountains are very picturesque from a tourist point of view but they are not so inviting to a surveyor. I opened up an old hunting trail that ran along the mountains to the north of Cedar creek and extended this trail to the headwaters of that creek, but could go no farther on account of rock bluffs around which a trail could not be built. I had two camps on the western slope. From the second camp to the summit there was a very steep ascent of about 2,000 feet. I sent the pack train with provisions around into Kootenay valley by way of Vermilion pass, the trip taking five days on account of the distance and the number of trees fallen across the trail. Meanwhile we packed the remainder of the outfit over the summit and about 2,000 feet down the other side to the first creek. We also cut a trail out to the main one along Kootenay river, thus making connections with the pack train. During the work on the summit we had very wet weather with some snow, hail and fog.

Kootenay valley is nearly four miles wide where the south limit of the railway belt crosses it. The soil is gravelly in most places, but near the river clay was found. The western side of the valley is heavily timbered with spruce, but the lower benches are chiefly covered with a jackpine *brulé*. The eastern side is covered with fir, spruce and jackpine.

Wild goats are very plentiful on the Beaverfoot mountains, while deer and moose were often seen along Kootenay river. Trout fishing was good in the river and in the lakes along its valley.

On August 30 we started for Leancoil along a good trail which connects with a wagon road eleven miles from the Canadian Pacific railway. The scenery along this trail was magnificent.

From Leancoil we moved to township 23, range 2, west of the sixth meridian, where camp was pitched about five miles southeast of Revelstoke on September 1. The surveys here included the outlines of some timber berths and were very difficult to make owing to the long climb to work, the large size of the timber and the very wet weather. The remainder of the surveys in this township were traverses of four small islands in Columbia river and a lake on the north boundary of section 14.

From September 26 to November 20 surveys were made along the main line of the Canadian Pacific railway from Boulder to Craigellachie, the work consisting of surveying all land likely to be required for settlement and making ties to the new double track survey of the railway.

From Craigellachie I went to Enderby and thence by wagon to township 18, range 8, west of the sixth meridian, where I completed the survey of timber berth No. 558. Eight inches of snow fell while we were in this township.

On November 27 we left for Enderby and the following day moved by wagon to Salmon river and camped in section 7, township 13, range 10. There was no snow on the ground in this township which was a welcome change from the country farther east. The work consisted of running the west boundaries of sections 6 and 7. All the country from Enderby to Salmon river and down the river to Shuswap lake is thickly settled, and all the farmers seem to be prosperous.





Photo by H. Matheson, D.L.S.

Bridge across Miette River near Jasper, Alberta.

This bridge crosses Miette river about a mile southwest of Jasper and was constructed by the Dominion Parks Branch. The road was made during the construction of the Grand Trunk Pacific railway and afterwards improved by the Dominion Government. Goat mountain is seen in the distance.







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Section 17, township 21, range 10, west of the sixth meridian was next reached. The west and east boundaries of the section were surveyed and on December 10 we moved by wagons about ten miles into Skimikin valley and camped in the southeast quarter of section 18, township 21, range 11. The road from Tappen through this valley is in good condition; it is an old road and is therefore well known. A large bench containing some good land in section 7 on the south side of the valley was surveyed. The farmers in Skimikin valley are fairly prosperous, one of them having about 150 head of stock.

Owing to the snow and the short days I decided to disband the party, and on December 23 I left for Revelstoke arriving there the following day with my outfit.

I have the honour to be, Sir,

Your obedient servant,

N. C. STEWART, D.L.S.



## APPENDIX No. 53.

## REPORT OF P. B. STREET, D.L.S.

## SUBDIVISION IN NORTHERN MANITOBA.

WINNIPEG, MAN., May 20, 1914

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa, Canada.

SIR,—I have the honour to submit the following general report of my survey in northern Manitoba during the season of 1913-14.

I reached Pas on June 20, 1913, and tried for several days to hire sufficient labourers for my party. Owing to the demand for labour on the Hudson Bay railway, I was able to secure only one man at this place. I had brought in several men from the outside points and commenced work with them in township 53, range 27, west of the principal meridian, on June 27. As soon as the work was well under way, I went to Prince Albert to secure the remainder of my party.

Our first work was the partial subdivision of townships 53 and 54, ranges 26 and 27. Pasquia river flows through these townships, emptying into Pasquia lake, a large shallow body of water, about twelve miles long and five miles wide with a maximum depth of about six feet at high water. The river leaves the lake again in township 56, range 26, and empties into Saskatchewan river. The Saskatchewan rises so high during June and July that the water is forced back up the Pasquia into Pasquia lake, which in turn overflows the surrounding country, rendering it useless for agriculture. When the Saskatchewan is lowered, and this overflow is prevented, some very good farmlands can be easily reclaimed. We saw hundreds of acres of fine hay growing five and six feet high in this vicinity. Summer frosts seem to be unknown, September 8 being the first day on which frost was recorded. No timber of any value was seen in these townships. East of the Pasquia the ground is covered with deep moss, which holds back the water like a sponge and prevents drainage, but there is plenty of slope to insure natural drainage if this moss were removed. This vicinity will be most valuable as a mixed farming district when the land is thus reclaimed. During our operations in this vicinity, we moved our camps either by boat on the Pasquia, or by means of a push car on the Canadian Northern railway which follows the same direction as the river.

On October 6, we moved north of Pas to make a partial subdivision of the townships along the Hudson Bay railway. This country is mostly swamp and muskeg, the ground being covered with a rank growth of moss, which frequently reaches a depth of six feet. Naturally drainage is impossible until the moss is removed. Ice can be found in July by removing a couple of feet of this moss, so that it is only natural to find that the spruce and tamarack which grow in these muskegs are very stunted. Occasionally patches of large spruce and tamarack are found. Gravel and rock ridges are common and are covered with spruce and jackpine. Two large lakes, Clearwater and Cormorant, lie northeast of Pas, and are nearly surrounded with rocky limestone ridges. The lands bordering on these lakes are mostly of a gravelly clay formation, covered with a very dense growth of spruce, jackpine, poplar and birch, ranging from three to ten inches in diameter. Very little of this wood is of any value for lumber but it makes a very attractive cordwood proposition. Unfortunately



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in clearing the right of way for the Hudson Bay railway, fires were allowed to spread, which destroyed several square miles of good jackpine timber. A large area lying between the Hudson Bay railway and Moose lake appears to be a totally useless swamp. It is regularly overflowed by the Saskatchewan at high water, and in many places it is impossible to find the bottom with a long pole. It is very doubtful if this area can be reclaimed.

We subdivided lands adjoining the Hudson Bay railway from mile 15 to mile 56. The muskegs froze about October 20, and during the next two months, we made very good progress with our work, as the weather was not very cold and there was little snow to impede our movements. After December we had frequent snowfalls until the snow attained a depth of thirty inches by April. During February, we had the usual cold spell, the thermometer for three weeks hovering between 30 and 50 degrees below zero. The lowest temperature recorded was 53 degrees below zero. During this cold period our axes suffered considerably. The blades chipped off every time a dry tree was encountered and the handles snapped in two nearly as fast as they could be replaced. Mounding on the gravel ridges was so tedious that many of the mounds were left until May. Fifty-four inches of ice formed on Clearwater lake prior to March 1.

Fishing in Clearwater, Cormorant and Moose lakes is carried on extensively every winter. Whitefish, trout, pickerel and jackfish are taken in large quantities and shipped from Pas. We saw several moose in this vicinity and a few caribou. Ptarmigan are very plentiful while the snow is on the ground, and, as might be expected, the numerous lakes around Pas are well stocked with geese and ducks of all varieties, affording excellent sport both in the spring and autumn.

The Hudson Bay railway is being built as rapidly as circumstances will allow. Crossing a muskeg country, as it does, it is very hard to get a good roadbed and the construction company have been very unfortunate in not finding suitable gravel pits for ballast. Gravel has had to be hauled for very long distances and the nature of the country requires an unusual amount of ballast to make a good road bed. The line has been well laid out with long tangents and easy curves, and when the road is finished, will be able to take care of heavy traffic.

High winds are very prevalent in this district, both in summer and in winter. We found it useless to break snow-shoe trails through the deep snow, as they are almost invariably drifted full and obliterated in a few hours. Except on the big lakes, the snow never seems to get sufficient crust to make good snow-shoeing.

By May 1, the country was becoming so wet that I decided to discontinue work as soon as I completed the necessary surveys in township 58, range 23, where I was then working. I kept a sub-party busy most of the time erecting monuments which had been left during the winter, and on May 14, we had completed our work and moved back to Pas, where I paid off the party. After storing my outfit in Pas, I left for home on May 18.

I have the honour to be, Sir,

Your obedient servant.

P. B. STREET, D.L.S.



## APPENDIX No. 54.

## ABSTRACT OF THE REPORT OF A. G. STUART, D.L.S.

## RETRACEMENT OF MERIDIAN AND BASE LINES IN MANITOBA AND SASKATCHEWAN.

My work during the past season consisted of the retracement of the second base line from the principal meridian to the second; the east boundary of range 31 west of the principal meridian from the international boundary to the seventh base line; the fifth, sixth and seventh base lines from the east boundary of range 31 west of the principal meridian to the second meridian; the third base line from the principal meridian east to the east boundary of range 7, and the east boundary of range 7 east of the principal meridian from the third base line to the fifth.

These retracements were made to serve as a working base from which to investigate and locate certain errors of previous surveys which were believed to exist.

Levels were taken in connection with the surveys and elevations were established in all the towns along the railways in the vicinity of the work. These levels can easily be reduced to mean sea-level datum and added to the great network of levels already taken over the country, which will some day be used for drainage, reclamations, railway location, highways and other engineering schemes.

Good roads were found almost everywhere in the vicinity of our work. The exceptions were the very rough wooded country in the Pembina mountains, near Swan lake, near Pelican lake and some swamp areas such as that in township 8, range 6, east of the principal meridian. One long stretch of well-graded road, runs from Beausejour to the settlements southeast of lake Winnipeg, passing through a low portion of the country where much drainage has been necessary. This road has probably the heaviest traffic of any rural highway in the West and is of great benefit to the farmers.

The country passed over has a close network of railways making the city market easily available to all farmers.

Pembina mountains in the southern part of Manitoba are a series of hills and deep ravines, heavily wooded with poplar and oak of large and small diameter. There is very little rock, but there is an abundance of blue clay suitable for brick manufacture, and on account of the convenient transportation connections with the large cities, this will some day be of economic value.

At Swan, Pelican and Whitewater lakes, which are in deep ravines and are surrounded by woods, the people from the nearby cities and towns have found pleasant summer resorts.

In that part of southeastern Saskatchewan through which we worked the land is not quite as heavy and rich as in southern Manitoba, but the conditions under which the crops were raised this season seemed very favourable and the harvest was an abundant one, and was marketed early. In this district there are some very prosperous German settlements, such as Langenburg.

The country northeast of Winnipeg is settled by homesteaders from Galicia, who have cleared the land they cultivate of heavy spruce and poplar. Considerable drainage has been done and more will be necessary in order to develop this district to its full extent.

During the winter months large quantities of wood and ties are shipped from railway points south, affording a means of making ready money. The present winter, however, has been so mild with practically no snow, that this industry is almost at a standstill and this has been keenly felt in the local business centres.

The Canadian Northern Railway company has at present the right of way cut for a line extending along the southeast side of lake Winnipeg. This will help to a very marked degree in opening up this portion of the country.



## APPENDIX No. 55.

## ABSTRACT OF THE REPORT OF C. H. TAGGART, D.L.S.

## SURVEYS IN THE KAMLOOPS DISTRICT OF THE RAILWAY BELT, BRITISH COLUMBIA.

On April 11, 1913, I left Ottawa for Kamloops, where I arrived on the 16th. I immediately commenced the organization of my party, which was completed on the 21st. On the morning of the 22nd we started for our first work in townships 19, ranges 14 and 15, and camp was pitched at the west end of Desdero lake.

The Kamloops to Okanagan wagon road runs through this township. At Holmwood post office in section 12, range 15, a branch road leads to the lands surveyed. Many fair pieces of agricultural land are to be found in this township. The settlers already located seem to be meeting with success; their chief crops being grain and hay, with some vegetables. Some good stock ranches are located along the Okanagan wagon road. It would seem that the farmers in this district would meet with greater success by introducing mixed farming on a larger scale, and making a specialty of hogs and poultry.

Our next work took us into township 17, range 13. It is expected by the residents there that the new Canadian Northern Pacific railway from Kamloops to Kelowna, on which it has been announced that construction is to commence this summer, will pass through this district. In anticipation of this fact a large portion of the land suitable for agriculture, has been purchased by a syndicate. The owners are doing little development work and seem to be holding the land simply for higher prices. On this account the district does not show much improvement. Much may be expected from it, however, with the advent of the railway and the breaking up of the large holdings into smaller farms.

Our next work was north of Kamloops lake, in townships 21, ranges 18, 19 and 20. Tranquille river flows through township 21, range 19, but its valley is very narrow and as a result no settlers have as yet located there. Two or three ranches are located higher up the valley, and there is some land under cultivation at the mouth of the river, on Kamloops lake. A new wagon road up Tranquille river is under construction; it follows the western slope of the valley, crossing to the east side in section 27. This road will give access to the country to the north in townships 22, ranges 20 and 21, and will aid very much in opening up this region. The soil on the bench lands on either side of the river, is rocky and dry and produces only a small quantity of grass.

The country in the vicinity of lac du Bois is suitable for dry farming. The soil is rich and areas of sufficient size for homesteading are to be found. A number of persons have already taken up land there and appear to be pleased with their prospects. The road from Kamloops is rather difficult to travel at present but it is said to be the intention of the settlers to try to induce the Provincial Government to improve the old road where the present grades are suitable and make diversions where they are unsuitable.

In July Tranquille river had a flow of 2.5 cubic feet per second. This water is all used in irrigating two ranches on Kamloops lake at the mouth of the stream.

Our next work was at Savona Ferry, at the west end of Kamloops lake. The main line of the Canadian Northern railway is under construction there and follows the north shore of Kamloops lake very closely. The construction of the railway along the lake shore was very expensive on account of the great amount of rock work, which had to be done. It was necessary to construct two tunnels.



A considerable area adjoining Savona Ferry has been subdivided into building lots, but so far as could be ascertained, there has not been a great demand for these lots. The district west of the mouth of Deadman river is being developed as a fruit growing area, and already many thriving apple orchards may be seen. This land is watered by an irrigation flume which takes water from Deadman river at a point about the middle of township 22, range 22.

We proceeded next to the Semlin valley in township 21, range 24. The valley is very fertile and capable, under irrigation, of producing hay, all kinds of grain and vegetables, and the hardier fruits. The land in this valley, part of which has been taken up since the early days, is at present held by large ranchers. The Hon. Charles Semlin ex-premier of British Columbia, is one of the largest holders. These ranchers have extensive grazing areas, in the Cariboo district, away to the north. Cattle are kept on these ranges during the growing season, and brought to the Semlin valley, to be wintered on the hay which has been put up for them during the summer. When they are in condition to be slaughtered, they are taken to Ashcroft.

We next completed the subdivision of township 21, range 25, which is high rolling range land, and practically uninhabited. It is mostly held under lease by stock owners. The Indian reserve in the middle of the township does not appear to be used by any one.

Our work continued westward into the valley of Hat creek. The best of the bottom lands of this valley have been taken up and used for cattle ranching for many years. On account of the advent of the Pacific and Great Eastern railway which passes within about ten or twelve miles of Hat Creek settlement, this valley is receiving a new impetus. Already a considerable number of additional homesteads have been taken up.

The closing weeks of the season were spent in making surveys near Thompson river in townships 18 and 19. The Canadian Northern Pacific railway follows closely the right bank of the river there. The grade is completed and ready to receive the steel. The railway parallels the old "Cariboo road," about which something of interest may be mentioned here.

This road is one of the original trunk roads of the province. It was built in the early sixties, for the purpose of furnishing a means of transport for the gold seekers who rushed from every corner of the earth, but chiefly from the gold fields of California, into the Cariboo country in the late fifties. The Cariboo road early became a regular route for passenger and mail stages. Later on an express company was formed, known as the British Columbia Express company, but which has always been known as the "B. X." This company operated until a few months ago, carrying His Majesty's mails from Ashcroft to Fort George. These stages are still operated in much the same style as in days gone by. The vehicles are very picturesque. They are drawn by four or six spirited young horses, and make the distance in very quick time. Fresh relays of horses are put in every fifteen miles. Besides the main route to Fort George, express lines run to Lilloet, Barkerville and other points in the interior. During the summer the stage runs north only as far as Soda creek. From there to Fort George passengers and mail are carried by boat up Fraser river.

Within the last few months, however, this historic express company has practically ceased to exist. Last year the Government mail contract was captured by a newly organized company known as the Inland Express company. The original company is understood to have sold the new company all their outfit with the exception of the river boats.

The portion of the "Cariboo road" south from Ashcroft has been used but very little since the completion of the Canadian Pacific railway. As a result the road has been allowed to fall into disrepair and in many places it is now almost impassable. It will always be required as a local road however and it is not probable that it will be allowed to fall into disuse entirely.



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The district in which our work was situated lies within what is known as the "Dry Belt" of British Columbia. This belt is very irregular in shape and extends from the west end of Shuswap lake westerly including the valley of Thompson river to its confluence with Fraser river. It extends a hundred miles or so north of Ashcroft, and includes the Nicola and Okanagan districts to the south. In many places through the Kamloops district, farming can be carried on successfully without irrigation at altitudes varying from two thousand feet to twenty-five hundred feet and over. Of course, even at these altitudes crops are grown successfully only when the principles of dry farming are practised. A remarkable feature about the character of the soil in many localities is that the richer and more productive soils are found at the higher altitudes. In the district about Kamloops the soil at altitudes exceeding twenty-five hundred feet is mostly black loam similar to that found in the prairie provinces. In fact where sufficiently large areas are to be found wheat and other crops are grown as on the prairie and during the last two years when the rainfall has been more copious than usual, with equal success.

At altitudes between three thousand and thirty-five hundred feet summer frosts are of frequent occurrence so that the more tender fruits and garden crops cannot be grown with success. As an altitude of four thousand feet is reached frosts occur throughout the summer and the only dependable crops which can be grown are hay and oats, the latter having to be cut and made into hay before reaching maturity. The soil at these altitudes is usually fertile and the rainfall sufficient.

The country generally is ideal for stock raising and the climate is said to be particularly suitable for horses.

This year weather conditions in the dry belt of British Columbia were excellent for survey operations. Although probably more than the average amount of rain fell during the season it did not hinder our work materially. A considerable portion of the area covered was range land and partly open so that an unusually large area was surveyed.



## APPENDIX No. 56.

## REPORT OF C. M. WALKER, D.L.S.

## MISCELLANEOUS SURVEYS AT BANFF.

BANFF, ALTA., January 28, 1914.

E. DEVILLE, Esq., LL.D.,  
Surveyor General,  
Ottawa, Canada.

SIR,—I have the honour to submit the following report, with reference to work done by my party during the season of 1913:

On May 12, I began my first work, the resurvey of the cemetery at Banff, Alberta, in the Rocky Mountains park. Only one section of the cemetery had been previously surveyed, though graves were to be found in the other sections, this necessitating considerable re-adjustment.

After the completion of the survey, I proceeded to lay out a cemetery in the vicinity of Bankhead on the eastern slope of Cascade mountain.

In the meantime, I had received instructions from the Department to work in conjunction with the Dominion Parks branch in the laying out and construction of roads, throughout the Rocky Mountains park.

The point at which both location and construction were begun this year, was about three and a half miles west of Banff, on the Banff Castle road. Several years ago, the road was constructed from Banff to this point, but was left in a very unfinished state. A repair gang was engaged on this portion of the road for a great part of the summer, and much work is still needed on it.

We began the final location of the road, from the point mentioned above, and continued westerly in the direction of Castle mountain. As, is to be expected, in a mountainous country, the ground surface is very much broken by ravines, ridges or rocky bluffs, thus making almost constant change in the direction of the road necessary in order that low grades might be maintained. Tangents are necessarily limited to very short distances. The measurements were all taken on the proposed centre line, and stations were placed every on hundred feet and sometimes oftener, as in case of curves where the centre line was staked, every twenty or twenty-five feet; the beginnings and ends of the curves were also marked on the ground. The profile of the centre line was then run and plotted, and the grades having been determined upon, stakes were driven marking the cut and fill. Cross-section stakes were also placed where necessary. Sheets or working sketches of the grade were made and supplied to each foreman of the several gangs employed on the construction.

Having completed the final location of the road from Banff to Castle mountain, a distance of about twenty miles, I next ran a traverse and levels over a right of way which was partially cleared several years ago, from Castle mountain to the boundary between Alberta and British Columbia, in the Vermilion pass. From this point the British Columbia Government have been constructing the road down through the Vermilion pass, to join the road running from Golden to Steele, near Windermere, in the upper Columbia valley. When this road is completed, probably two years hence, there will be thrown open to the tourist, one of the finest scenic routes on the continent.

We next moved to Field, British Columbia, in order to make some small miscellaneous surveys including the laying out of a cemetery. I also traversed the road leading from Field to Emerald lake, while in the neighbourhood.



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This road about seven miles in length, was found to be in very good condition, and it leads to one of the beauty spots in Yoho park, that is, Emerald lake. One view alone of this beautiful lake hidden away at the back of Mount Burgess, surely repays the tourist for the time spent in reaching it.

Our next move was made to Glacier, British Columbia, to do some miscellaneous work in connection with roads. The only wagon road leading out of Glacier, is the one in the direction of Nakimu caves, which are about seven miles distant. The road is somewhat steep for carriages, and has, therefore, been constructed on the southern and western slopes of Mt. Cheops. At present the road does not go right to the caves but has stopped about one-half mile therefrom.

Only two of the caves are open to the public as yet, but surveys were being carried on this summer with a view to opening up the largest of them by means of a tunnel, from the outside, thus making it accessible to visitors at all times of the year. Up to the present time the largest cave just referred to has been accessible only when the stream which runs through it is very low and even then, there has been considerable risk attached. These caves constitute the most interesting spot for the sightseer.

Having traversed the road to the caves and completed the survey of a small parcel of land for private leasehold close to Glacier station, we returned to Castle mountain, Alberta, and began the final location survey of the auto road on the north side of Bow river, from Castle to Laggan, a distance of about eighteen miles. The country is timbered throughout the length of the proposed road, with small jackpine, spruce and scattered fir. As a general rule, however, the timber is so small that it is difficult to obtain proper timbering for the necessary culverts and wooden bridges along the road. Splendid views of the mountains are to be obtained throughout the entire route.

Just at the time when I was completing the location survey of this road I was requested by the Commissioner of Parks, to also make a road survey on the south side of the Bow, from Laggan to Castle in order that a comparison of the two routes could be made as to desirability and respective cost. Accordingly, as soon as I had reached Laggan on the north side, I began the survey of the route on the south side of the Bow, from Laggan back to Castle.

I received instructions from the Department at this time, that Mr. T. H. Mawson, the noted landscape and civic design artist, was proceeding to Banff, in order to make plans for the beautifying of Banff and vicinity, and that the Department wished me to make any surveys which Mr. Mawson might desire for the obtaining of necessary information.

On interviewing him I was informed that ten-foot contours were necessary and that they were needed at once, over an area of about six hundred acres in the villa lot section, on the south side of Bow river at Banff. Consequently about November 1, I was compelled to organize a second party to carry on the work in this connection. This party was kept busy for one month. On the completion of the survey of the road from Laggan to Castle on the south of the Bow, I moved the party to Banff, where we were engaged in making various surveys in the villa lot section. I then made a survey of the new golf course enlarging the old one sufficiently to make the grounds suitable for an eighteen link course.

A small parcel of land was also surveyed in section 29, township 25, range 12, west of the fifth meridian for purposes of picnic grounds, to be reached by a motor launch, from Banff.

Throughout the whole season, it was necessary to keep in constant touch with the construction work, on the various roads for the purpose of setting bridge levels, grades, etc.

Having completed the work for which I had received instructions I disbanded my party for the season on December 16, storing the outfit at Banff.

I have the honour to be, Sir,

Your obedient servant,

C. M. WALKER, D.L.S.



## APPENDIX No. 57.

## ABSTRACT FROM THE REPORT OF B. W. WAUGH, D.L.S.

## MERIDIAN AND BASE LINE SURVEY IN NORTHERN MANITOBA.

My work during the season of 1913-14 consisted of the survey of part of the principal meridian from townships 73 to 80 inclusive and parts of the twentieth and twenty-first base lines.

The party having been organized, and the necessary outfit obtained, we left Selkirk for Warren's landing on May 24, 1913, one-half of the party on the *S.S. Mikado* and the remainder on the *S.S. Wolverine*. The southern end of lake Winnipeg was then completely free of ice, but towards the northern end we encountered large cakes of rotten ice miles in extent. From Warren's landing we travelled to Norway House on the tug *Highlander*, and from there by canoe down Nelson river to Cross portage, and thence to Landing lake where our work commenced.

On June 11 work was started on the principal meridian at the northeast corner of section 24, township 72 and continued steadily until August 22 when the northeast corner of section 13, township 80 was reached. During this time we had succeeded in getting only a small portion of our supplies down Nelson river from Norway House, the Hudson's Bay company, on whom we were depending for our transportation, having difficulty in obtaining the necessary help from the Indians. It was deemed advisable, therefore, on account of the short season then left for navigation, that we freight our own winter supplies by canoe, and consequently we left camp for Norway House on August 26, arriving there on September 6. The canoes were loaded and started for Split lake on the following Monday. I took advantage of this opportunity to go to Selkirk to purchase dogs for the winter work.

By this time McMillan Bros. had completed a transportation route from Whiskey Jack portage, between Playgreen lake and Cross lake, to Shoal falls on the Nelson, about eight miles below Cross lake, and then were engaged in laying a pole track from there to the southwest end of Sipiwesk lake. This afforded us great assistance in our transportation, as we were able to get the remainder of our supplies to Whiskey Jack by the tug *Highlander*, across this portage by McMillan Bros'. teams and thence to Shoal falls by means of their barge. From Shoal falls our canoes took their next load of supplies to Partridge Crop lake on the twentieth base-line, where I left one man to mind cache and fish for dog-feed. The remainder of our supplies, with the exception of the dog-biscuit, we succeeded in getting across McMillan's pole track to Sipiwesk lake and from there to Split lake by our own canoes, where we were frozen in on October 19, small sluggish creeks having frozen over as early as October 12. It then became necessary for us to build hand sleighs to move our supplies and camp equipment to the end of the meridian in township 80, and work was commenced on the line again on November 10. On the 11th the twenty-first base line east of the principal meridian was turned off and produced to the end of range 9 by January 21, 1914. We then moved to the twentieth base line completing the seven ranges east of the meridian on March 9 and the three ranges west of the meridian on March 27.

During the summer canoes and man-packing were our means of transportation while in the winter dogs were used.

This summer it is the intention of McMillan Bros. to put a launch and a barge on Sipiwesk lake to run from the north end of their pole track on this lake to Manitou rapids. This will afford the best means of transport to Manitou rapids until the Hudson Bay railway is completed to that place.



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*General description of the country.*

In crossing Landing lake, in which the northeast corner of township 72, range 1, falls, the meridian passes from a country in which rock outcroppings is the prominent feature into a clay belt; this continues as far north as township 80, the rock becoming gradually less frequent. The clay belt is rolling, with swampy valleys, and the soil is clay and clay loam. In most cases the swampy valleys would be quite easily drained into the different rivers and lakes. The hills and ridges become higher to the northward, until in township 80 they reach a height of about two hundred feet. The ridges and valleys lie in a northeasterly and southwesterly direction.

Along the twenty-first base line the clay belt continues but the country is more level east of Burntwood river and is, although fairly dry, much more swampy than that previously passed. In ranges 8 and 9 the country becomes more of the muskeg variety and to the east, south and southwest of these ranges it appears to be almost continuous muskeg with occasional jackpine ridges.

The twentieth base line to the east in range 1 passes through Partridge Crop lake and the remainder of the line passes through country with a good clay loam soil. The country is rolling with some muskeg of considerable extent. In range 7 on the east side of the Nelson the country becomes more swampy, and farther east appears to drop into the regular muskeg country.

Westward from the principal meridian on the twentieth base line the rock more nearly approaches the surface and in some cases bald rocks appear. The country consists of long ridges running in a northeasterly and southwesterly direction with broad deep valleys intervening.

*Description of the principal lakes and rivers.*

In section 1, township 73, range 1, the meridian crosses Landing lake, a long narrow body of water about three-quarters of a mile wide and thirty miles long. The lake is very deep and whitefish are plentiful.

Wintering lake, crossing townships 73, 74 and 75, range 2, west, Partridge Crop lake along the twentieth base line, Natawahunan lake in township 78, range 3, east and Armstrong lake in township 78, range 4, east are all well stocked with fish, the principal variety of value being whitefish. The species caught in these lakes, although inferior to the lake Winnipeg whitefish, are of good quality and no doubt, in the near future when the transportation in this country is benefited by the Hudson Bay railway, fishing stations will be established there. Small patches of timber consisting of spruce from six to ten inches in diameter, are found on some of the points on the shores of these lakes. Landing lake, Wintering lake, Partridge Crop lake and Armstrong lake and river appear to lie on rock contact depressions; the only indications of mineral however are seen in pegmatite veins which cut the granite containing pyrite, muscovite, some amber mica, chalcopyrite and molybdenum in small quantities. Some quartz veins were observed on Natawahunan lake, but in nearly all cases were found barren. A number of discovery claims have been "staked" in these places.

In section 12, township 80 the meridian crosses Burntwood river, and this river is again crossed three times by the twenty-first base line in ranges 2 and 3. Its banks are clay about fifty feet high, with occasional rock outcroppings. On the lower portion there are only three falls, the river being mostly wide and the current slow but the upper part has many rapids.

Odei river, crossing the twenty-first base line in ranges 1 and 2, east is a tributary of Burntwood river, and is most remarkable for the straightness of the fifteen miles nearest its mouth. Its banks are from one hundred to two hundred feet high on the lower part and very low and swampy in the upper part. Over a stretch of three miles in section 2, township 81, range 1 and sections 35, 36 and 25, township 80, range 1,



there is a drop of nearly one hundred feet affording good water-power but the lower part of this river is free from rapids. Whitefish and sturgeon are to be found in this river.

In range 5 the twenty-first base line crosses Witchai lake, a large shallow L-shaped body of water in which whitefish are plentiful. This lake as well as Natawahunan and Partridge Crop lakes are merely enlarged portions of Grass river which empties into Split lake. That portion of Grass river between Natawahunan lake and Split lake is very shallow and contains many rapids, making it a very poor canoe route.

Split lake which is an enlargement of Nelson river is a large body of water about twenty miles long and from ten to fifteen miles wide. It has a very uneven rocky shore line making many long narrow bays, and contains many islands, hence in some places the current is strong causing heavy seas in certain winds. The whitefish in this lake are small and not plentiful.

The winter trail from Split lake to Norway House runs along this river to Natawahunan lake where it turns to the south, going overland to Landing lake and thence over Cross portage to Sipiwesk lake. Another route is to go up Grass river through Partridge Crop lake to Wintering lake, and thence by way of Thicket portage, Landing lake and Fiddle river to Sipiwesk lake.

The proposed line of the Hudson Bay railway crosses the meridian in township 74, and the twentieth base line in range 3, east of the principal meridian. Along this railway line McMillan Bros. have a winter road cut as far north as mile 290.

No timber or minerals of value were found except those already mentioned. The timber throughout the country is invariably small spruce, jackpine and poplar on the ridges, and small spruce, tamarack and birch in the valleys.

Whitefish are plentiful in most of the larger lakes and rivers, and in Grass, Odei and Nelson rivers sturgeon are to be found.

In the fall during freeze-up caribou pass through the country around Split lake in herds, and it is a common occurrence to hear of one man shooting as many as thirty in one day. The Indians depend largely on these caribou for their winter supply of meat for themselves and their dogs. Moose are plentiful in Natawahunan lake district and a few bears are to be found there. Foxes are the chief fur-bearing animals of the district but mink, bob-cat, wolves and others are also plentiful.

The summer in this country appears to be very short, the snow leaving about the latter part of April and coming again in October. Last summer was very wet and cold and during August we had several frosts. Towards the end of the winter the snow became very deep, being from three to three and a half feet. The winters are extremely cold, the average minimum temperature often being about forty degrees below zero for a period of four to six weeks.



SESSIONAL PAPER No. 25b

## APPENDIX No. 58.

## RESULTS OF MAGNETIC OBSERVATIONS.

TABLE I. DECLINATION OBSERVATIONS.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
44° 00' N.-NE. cor. sec. 22	16	6	E. pr.	Oct. 4, '13	12 27.8	C. F. Aylsworth.
5° 00' N. "	10	15	"	Dec. 27, '13	9 29.7	G. A. Bennett.
5° 00' N. "	10	15	"	" 27, '13	30.9	"
30° 00' S. "	15	15	"	July 6, '13	11 05.2	W. J. Deans.
30° 00' S. "	15	15	"	" 6, '13	06.8	"
30° 00' S. "	15	15	"	" 7, '13	02.8	"
30° 00' S. "	15	15	"	" 6, '13	09.7	"
20° 00' S. "	15	15	"	" 20, '13	9 28.1	"
20° 00' S. "	15	15	"	" 20, '13	10.1	"
20° 00' S. "	15	15	"	" 20, '13	22.1	"
20° 00' S. "	15	15	"	" 20, '13	32.6	"
0° 65' S. "	15	15	"	" 26, '13	6 05.7	"
0° 65' S. "	15	15	"	" 26, '13	5 51.6	"
1° 00' N. "	15	15	"	" 27, '13	6 09.1	"
1° 00' N. "	15	15	"	" 27, '13	08.4	"
78° 68' W. "	68	1	Pr.	June 11, '13	17 31.6	G. H. Herriot.
59° 97' W. "	68	1	"	" 12, '13	15 15.0	"
60° 94' W. "	68	1	"	" 17, '13	14 23.4	"
44° 60' W. "	68	2	"	" 19, '13	15 30.1	"
59° 80' W. "	68	2	"	" 21, '13	16 12.2	"
At "	72	2	"	Aug. 16, '13	16 19.2	"
55° 91' W.-NE "	72	2	"	" 23, '13	20 17.6	"
60° 00' N. "	20	3	"	Nov. 5, '13	13 52.1	C. F. Aylsworth.
35° 00' N. "	21	3	"	Oct. 29, '13	30.9	"
At "	21	3	"	Nov. 7, '13	35.8	"
At "	21	3	"	" 11, '13	50.1	"
At "	21	3	"	" 13, '13	38.4	"
At "	21	3	"	" 17, '13	45.9	"
20° 00' N.-NE cor. sec. 19	21	3	Pr.	Nov. 25, '13	13 38.8	C. F. Aylsworth.
60° 00' N. "	21	3	"	" 25, '13	38.7	"
At "	21	3	"	" 27, '13	42.5	"
At "	21	3	"	" 26, '13	32.4	"
At "	21	3	"	" 29, '13	42.8	"
10° 00' E. "	28	3	"	Mar. 8, '13	12 59.9	W. J. Deans.
10° 00' E. "	28	3	"	" 9, '13	56.8	"
11° 95' W. "	68	3	"	July 4, '13	18 22.9	G. H. Herriot.
27° 57' W. "	72	3	"	Aug. 28, '13	15 37.6	"
8° 13' W. "	72	3	"	" 29, '13	14 08.0	"
48° 00' N. "	21	4	"	June 27, '13	13 32.8	C. F. Aylsworth.
30° 00' N. "	22	4	"	" 23, '13	40.7	"
At "	22	4	"	" 24, '13	53.6	"
At "	22	4	"	" 26, '13	26.0	"
At "	22	4	"	" 27, '13	37.2	"
At "	22	4	"	" 27, '13	30.1	"
At "	22	4	"	" 27, '13	21.7	"
At "	22	4	"	" 27, '13	26.1	"
At "	22	4	"	July 2, '13	16.1	"
20° 00' W. "	22	4	"	" 4, '13	14.4	"
40° 00' N. "	22	4	"	" 5, '13	51.5	"
At "	22	4	"	" 9, '13	33.7	"
At "	22	4	"	" 11, '13	30.1	"
At "	22	4	"	" 17, '13	37.4	"
55° 00' N. "	22	4	"	" 22, '13	43.7	"
At "	22	4	"	June 18, '13	34.7	"
15° 00' N. "	28	4	"	Mar. 5, '13	12 55.7	W. J. Deans.
15° 00' N. "	28	4	"	" 6, '13	59.1	"



RESULTS OF MAGNETIC OBSERVATIONS—*Continued.*TABLE I.—DECLINATION OBSERVATIONS—*Continued.*

Place.	Township.	Range.	Meridian.	Date.	Declination	Observer.
56° 53' W..	" 35.	68 4	"	July 10, '13	16 37.5	G. H. Herriot.
27° 40' W..	" 36.	72 4	"	Sept. 5, '13	14 32.8	"
25° 55' W..	" 35.	72 4	"	" 6, '13	14.2	"
20° 00' W..	" 31.	72 4	"	" 10, '13	02.5	"
At " 4.	23 5	"	"	Aug. 20, '13	15 32.7	C. F. Aylsworth.
At " 16.	23 5	"	"	" 21, '13	31.3	"
55° 00' N.-NE cor. sec. 8.	23 5	Pr.	"	Aug. 25, '13	13 27.8	C. F. Aylsworth.
At " 30.	23 55	"	"	" 29, '13	36.8	"
At " 21.	23 5	"	"	Sept. 1, '13	28.2	"
At " 26.	23 5	"	"	" 12, '13	49.5	"
10° 00' N..	23 5	"	"	" 8, '13	50.1	"
At " 36.	28 5	"	"	Feb. 28, '13	07.6	W. J. Deans.
At " 36.	28 5	"	"	Mar. 2, '13	08.6	"
At " 36.	28 5	"	"	" 3, '13	04.9	"
39° 05' W..	32.	68 5	"	July 24, '13	18 20.8	G. H. Herriot.
6° 97' W..	35.	72 5	"	Sept. 14, '13	13 20.3	"
72° 00' W..	36.	29 6	"	Feb. 22, '13	13 09.9	W. J. Deans.
7° 00' "	36.	29 6	"	" 23, '13	10.4	"
10° 00' S..	36.	29 6	"	" 20, '13	13 11.6	"
30° 00' W..	36.	29 6	"	" 21, '13	00.0	"
60° 55' W..	34.	68 6	"	Aug. 6, '13	19 24.1	G. H. Herriot.
53° 73' W..	33.	72 6	"	Oct. 1, '13	18 10.5	"
20° 00' W..	32.	72 6	"	" 2, '13	16 52.7	"
50° 00' N.-SE	1.	31 7	"	Feb. 16, '13	13 49.3	W. J. Deans.
" 1.	31 7	"	"	" 17, '13	53.8	"
" 1.	31 7	"	"	" 18, '13	55.7	"
67° 71' W.-NE	33.	64 7	"	July 1, '13	16 29.7	O. Rolfsen.
49° 90' W..	35.	68 7	"	Oct. 29, '13	15 15.4	G. H. Herriot.
21° 10' W..	32.	68 7	"	Nov. 1, '13	14 52.6	"
2° 99' W..	31.	68 7	"	" 3, '13	15 23.7	"
16° 77' W..	32.	64 8	"	July 10, '13	15 13.0	O. Rolfsen.
19° 82' W..	33.	68 8	"	Nov. 6, '13	17 00.2	G. H. Herriot.
40° 00' W..	15.	25 9	"	Dec. 16, '13	13 21.6	G. A. Bennett.
12° 00' W.- $\frac{1}{2}$ cor. E by sec. 22	25 9	"	"	" 18, '13	24.4	"
60° 48' W.-NE cor. sec. 34	60 9	"	"	Jan. 1, '13	16 49.0	O. Rolfsen.
29° 40' W..	32.	64 9	"	July 15, '13	14 49.5	"
72° 57' W..	34.	68 9	"	Nov. 12, '13	13 11.3	G. H. Herriot.
52° 65' W..	35.	64 10	"	July 18, '13	13 42.9	O. Rolfsen.
27° 96' W..	35.	64 10	"	" 21, '13	46.8	"
27° 96' W.-NE cor. sec. 35.	64 10	Pr.	"	July 21, '13	13 49.7	O. Rolfsen.
61° 95' W..	31.	64 10	"	" 24, '13	16 53.5	"
0° 18' W..	36.	68 10	"	Nov. 15, '13	15 11.9	G. H. Herriot.
4° 20' W..	34.	68 10	"	" 18, '13	12 07.0	"
4° 14' W..	33.	64 11	"	July 30, '13	21 02.4	O. Rolfsen.
56° 27' W..	31.	68 11	"	Nov. 28, '13	17 13.6	G. H. Herriot.
70° 00' W.-SE	6.	23 12	"	Jan. 1, '13	14 36.1	W. J. Deans.
24° 03' W.-NE	31.	60 12	"	Feb. 1, '13	15 49.4	O. Rolfsen.
16° 63' W..	32.	64 12	"	Aug. 5, '13	19 01.9	"
36° 00' W..	35.	63 12	"	Dec. 1, '13	16 29.4	G. H. Herriot.
74° 95' W..	34.	68 12	"	" 2, '13	17 51.5	"
30° 00' S..	2.	23 13	"	Jan. 2, '13	15 09.7	W. J. Deans.
52° 90' W..	32.	60 13	"	Feb. 3, '13	18 05.7	O. Rolfsen.
52° 90' W..	32.	60 13	"	" 3, '13	24.7	"
12° 34' W..	33.	64 13	"	Aug. 9, '13	16 44.5	"
12° 34' W..	33.	64 13	"	" 9, '13	44.7	"
4° 00' W..	33.	68 13	"	Dec. 9, '13	16 03.6	G. H. Herriot.
76° 75' W..	33.	68 13	"	" 1, '13	17 06.5	"
70° 00' W..	7.	33 14	"	Jan. 15, '13	15 14.1	W. J. Deans.
19° 16' W..	36.	60 14	"	Feb. 6, '13	22 14.5	O. Rolfsen.
67° 00' W..	34.	60 14	"	" 8, '13	17 17.1	"
67° 00' W..	34.	60 14	"	" 8, '13	13.4	"
67° 00' W..	34.	60 14	"	" 8, '13	12.5	"
59° 70' W..	35.	64 14	"	Aug. 21, '13	16 48.0	"
17° 00' N..	8.	29 15	"	Nov. 19, '13	13 59.6	R. C. Purs
At $\frac{1}{2}$ cor. N. by sec. 9.	29 15	"	"	" 22, '13	59.6	"



SESSIONAL PAPER No. 25b

## RESULTS OF MAGNETIC OBSERVATIONS—Continued.

TABLE I.—DECLINATION OBSERVATIONS—Continued.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
At NE cor. sec. 36	33	15	"	June 25, '12	15 56.1	T. H. Plunkett.
75° 00 S. "	15	33	15	Jan. 13, '13	14 59.6	W. J. Deans.
76° 00 S. "	3	34	15	" 14, '13	15 35.0	"
35° 59 S. "	13	34	15	June 27, '12	51.8	T. H. Plunkett.
5 44 N. "	25	34	15	" 30, '12	17 03.9	"
56° 57 W. "	35	60	15	Feb. 14, '13	16 44.4	O. Rolfson.
4 49 W. "	35	60	15	" 17, '13	10.4	"
4 40 W. NE cor. sec. 35	60	15	Pr.	Feb. 17, '13	16 09.1	O. Rolfson.
1° 53 W. "	31	60	15	" 17, '13	41.8	"
1° 53 W. "	31	60	15	" 17, '13	43.8	"
50° 47 W. "	32	61	15	Aug. 27, '13	17 42.2	"
48° 00 W. "	33	68	15	Dec. 23, '13	16 55.0	G. H. Herriot.
38° 00 W. "	32	68	15	" 26, '13	48.1	"
0° 73 W. "	34	60	16	Feb. 25, '13	27 28.6	O. Rolfson.
0° 73 W. "	34	60	16	" 25, '13	28.1	"
15° 00 W. "	34	68	16	Dec. 31, '13	20 15.0	G. H. Herriot.
77° 70 W. "	32	60	17	Mar. 5, '13	18 16.8	O. Rolfson.
8 85 W. "	35	64	17	Sept. 12, '13	16 44.6	"
56° 00 E. "	34	40	18	Feb. 13, '13	17 45.4	T. H. Plunkett.
30° 00 E. "	36	40	18	" 14, '13	46.0	"
23° 50 W. "	33	60	18	Mar. 10, '13	18 11.2	O. Rolfson.
23° 50 W. "	33	60	18	" 10, '13	11.8	"
61° 05 W. "	34	64	18	Sept. 24, '13	19 09.6	"
19° 95 W. "	32	64	18	" 25, '13	27.3	"
At "	33	40	19	Feb. 5, '13	18 16.4	T. H. Plunkett.
63° 00 E. "	35	40	19	" 8, '13	27.3	"
63° 00 E. "	35	40	19	" 8, '13	27.0	"
18° 05 W. "	34	60	19	Mar. 14, '13	33.0	O. Rolfson
18° 05 W. "	34	60	19	" 14, '13	31.9	"
56° 54 W. "	31	64	19	Oct. 1, '13	17 36.9	"
30° 00 E.-NW "	30	1	20	Nov. 22, '13	14 44.1	W. J. Deans.
8° 00 E. Wit. M-marked 7-78 N.-NE.						
cor. sec. 33.	17	20	"	June 12, '13	14 51.6	G. A. Bennett.
" "	33	17	20	" 12, '13	52.2	"
" "	33	17	20	" 12, '13	55.9	"
" "	33	17	20	" 12, '13	53.1	"
79° 00 E.-NE. cor. sec. 33	40	20	"	Jan. 31, '13	19 31.5	T. H. Plunkett.
16° 67 W. "	32	60	20	Mar. 21, '13	15.2	O. Rolfson.
60° 03 W. "	31	60	20	" 23, '13	18 44.8	"
60° 03 W. "	31	60	20	" 23, '13	46.1	"
60° 00 W. "	18	20	21	June 20, '13	15 48.2	G. A. Bennett.
18 65 E. "	32	40	21	Jan. 24, '13	17 23.1	T. H. Plunkett.
14° 00 E. "	33	40	21	" 27, '13	02.1	"
43° 00 E. "	31	44	21	Mar. 21, '13	11.9	"
11° 41 E. "	33	44	21	" 22, '13	07.3	"
60° 20 W. "	32	60	21	" 26, '13	18 17.1	O. Rolfson
60° 20 W. "	32	60	21	" 26, '13	17.7	"
16° 00 N. "	24	20	22	June 20, '13	16 01.2	G. A. Bennett.
53° 00 E. "	34	40	22	Jan. 14, '13	20 06.3	T. H. Plunkett.
51° 00 E. "	31	44	22	Mar. 17, '13	17 29.3	"
36° 00 E. "	32	44	22	" 18, '13	17.2	"
18° 30 W. "	31	60	22	" 30, '13	18 00.0	O. Rolfson.
18° 30 W. "	31	60	22	" 30, '13	17 58.6	"
70° 71 E. "	36	40	23	Jan. 8, '13	17 52.6	T. H. Plunkett.
62° 00 E. "	34	44	23	Mar. 13, '13	16 56.6	"
14° 30 W. "	36	60	23	" 31, '13	18 06.7	O. Rolfson.
30° 00 W. "	35	39	24	Dec. 11, '13	16 40.3	W. J. Deans.
10° 00 S. "	55	39	24	" 12, '13	43.6	"
28° 00 E. 1/4 cor. N. by sec. 31	40	24	"	" 30, '12	17 07.9	T. H. Plunkett.
60° 00 W.-NE cor. sec. 36	40	24	"	Jan. 6, '13	10.3	"
55° 00 W. "	31	40	24	Dec. 9, '13	18.4	W. J. Deans.
40° 60 W. "	32	60	24	April 3, '13	59.5	O. Rolfson.
40° 60 W. "	32	60	24	" 3, '13	58.3	"
At "	36	40	25	Dec. 8, '13	01.5	W. J. Deans.....



RESULTS OF MAGNETIC OBSERVATIONS—*Continued.*TABLE I.—DECLINATION OBSERVATIONS—*Continued.*

Place.			Township.	Range.	Meridian.	Date.	Declination.	Observer.
At							° ' "	
15° 00 S.	"	35	40	25	"	" 10, '13	16 48 6	"
At	"	13	41	25	"	" 8, '13	16 51 0	"
60° 00 E.	"	35	44	25	"	Mar. 9, '13	17 48 6	T. H. Plunkett.
60° 00 E.	"	34	57	25	"	Jan. 27, '13	19 24 2	E. W. Berry.
5° 00 N.	"	35	57	25	"	" 28, '13	17 35 6	"
42° 00 E.	"	25	57	25	"	Feb. 3, '13	19 10 8	"
40° 00 N.	"	33	57	25	"	" 10, '13	19 19 5	"
50° 00 N.	"	35	57	25	"	" 12, '13	17 52 2	"
20° 00 W.-NE cor. sec. 34	"	34	57	25	"	" 13, '13	33 4	"
8° 00 N.	"	27	57	25	Pr.	Feb. 17, '13	19 09 8	E. W. Berry.
43° 00 W.	"	22	57	25	"	" 17, '13	17 55 4	"
20° 00 S.	"	28	57	25	"	" 18, '13	19 50 6	"
10° 00 N.	"	29	57	25	"	" 19, '13	20 58 4	"
45° 00 N.	"	33	57	25	"	" 21, '13	29 5	"
65° 00 E.	"	10	57	25	"	" 24, '13	18 07 7	"
60° 00 N.	"	11	57	25	"	" 27, '13	15 43 5	"
65° 00 E.	"	11	57	25	"	" 28, '13	16 58 9	"
60° 00 N.	"	2	57	25	"	Mar. 1, '13	19 05 1	"
50° 00 N.	"	17	57	25	"	" 3, '13	15 46 9	"
35° 00 N.	"	18	57	25	"	" 5, '13	21 32 5	"
50° 00 N.	"	6	57	25	"	" 12, '13	18 59 2	"
14° 03 W.	"	32	60	25	"	" 13, '13	19 56 5	"
35° 00 N.	"	15	58	26	"	April 4, '13	17 59 1	O. Rolfson.
75° 00 E.	"	22	58	26	"	" 4, '13	18 04 7	"
42° 00 N.	"	16	58	26	"	Jan. 16, '13	18 50 2	E. W. Berry.
7° 36 W.	"	34	60	26	"	" 17, '13	19 03 7	"
61° 83 W.	"	34	60	27	"	" 18, '13	18 38 8	"
16° 90 W.	"	35	60	28	"	Nov. 13, '13	17 25 7	O. Rolfson.
60° 14 W.	"	33	60	29	"	" 20, '13	19 01 1	"
At $\frac{1}{4}$ cor. E. by sec. 5	"	33	31	"	"	" 22, '13	21 27 5	"
32° 41 E.-NE cor. sec. 31	"	52	31	"	"	Dec. 1, '13	20 16 2	"
50° 52 E.	"	52	31	"	"	June 19, '13	16 01 4	R. C. Purser.
50° 52 E.	"	52	31	"	"	April 3, '12	19 19 7	T. H. Plunkett.
1° 02 W.	"	48	1	2	"	" 4, '12	20 33 1	"
1° 02 W.	"	48	1	2	"	" 4, '12	19 7	"
19° 30 W.	"	48	2	2	"	Mar. 23, '12	19 57 0	"
43° 24 W.	"	48	2	2	"	" 23, '12	56 7	"
69° 59 W.	"	48	3	2	"	May 2, '13	20 36 9	"
At $\frac{1}{4}$ cor. E. by sec. 29	"	25	4	2	"	" 16, '13	19 42 2	"
10° 00 W. 13° 00 N.-NE cor. sec. 18, Sta. 16, Lake traverse	"	25	4	2	"	" 22, '12	20 19 3	"
20° 00 N.-NE cor. sec. 4	"	11	6	2	"	Dec. 23, '13	18 07 7	R. C. Purser.
28° 00 S.	"	7	10	8	2	" 24, '13	18 04 1	"
28° 00 S.	"	7	10	8	2	" 13, '13	39 5	G. A. Bennett.
At	"	27	19	8	2	Nov. 5, '13	03 5	"
40° 02 W.	"	33	45	9	2	" 5, '13	04 6	"
40° 02 W.	"	33	45	9	2	Oct. 31, '13	19 23 7	"
40° 02 W.	"	33	45	9	2	June 21, '13	20 46 7	C. F. Miles.
5° 00 E.	"	33	45	9	2	" 14, '13	36 9	"
5° 00 E.	"	33	45	9	2	" 21, '13	37 8	"
At	"	31	6	10	2	" 13, '13	36 9	"
40° 00 W.	"	11	7	10	2	" 13, '13	28 8	"
40° 00 E.	"	9	7	10	2	July 17, '13	18 04 9	G. A. Bennet.
20° 00 E.	"	31	7	10	2	" 9, '13	17 45 3	"
20° 00 E.	"	31	7	10	2	" 10, '13	45 6	"
6° 50 E.	"	5	20	10	2	" 16, '13	18 11 7	"
40° 00 E.	"	10	48	10	2	" 16, '13	11 6	"
25° 00 N.	"	14	48	10	2	" 23, '13	19 02 6	"
At NE	"	20	48	10	2	Oct. 9, '13	37 3	W. J. Deans.
50° 00 W.	"	27	48	10	2	" 10, '13	52 2	"
25° 00 N.-SE	"	27	48	10	2	" 12, '13	20 08 0	"
At NE	"	23	48	10	2	" 13, '13	19 27 2	"
	"				"	" 14, '13	46 6	"
	"				"	" 16, '13	52 3	"



SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS—*Continued.*TABLE I.—DECLINATION OBSERVATIONS—*Continued.*

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
70°00 N.-SE cor. sec. 26	48	10	2	Oct. 17, '13	57.8	W. J. Deans.
20°00 N.-NE " 26	48	10	2	" 20, '13	20 33.0	"
At " 21	48	10	3	" 21, '13	19 58.0	"
5°00 S.- " 20	48	10	2	" 22, '13	56.9	"
At " 21	26	11	2	June 13, '13	18 08.9	R. C. Purser.
At " 21	26	11	2	" 15, '13	05.7	"
At $\frac{1}{4}$ cor. E. by sec. 28	33	11	2	Dec. 1, '13	44.0	"
17°32 W.- $\frac{1}{4}$ cor. N. by sec. 22	33	11	2	" 2, '13	47.1	"
14°99 S.-NE cor. sec. 27	33	11	2	" 3, '13	48.4	"
15°00 S.- $\frac{1}{4}$ cor. E. by sec. 28	33	11	2	" 4, '13	49.1	"
At $\frac{1}{4}$ cor. E. by sec. 2	33	11	2	Dec. 8, '13	18 47.6	R. C. Purser.
28°50 E. 31°00 N.-NE cor. sec. 2, Sta. 11, Lake traverse	33	11	2	" 10, '13	48.9	"
11°50 N. 4°00 W.-SE cor. sec. 1, Sta. 4, Lake traverse	33	11	2	" 12, '13	19 21.6	"
29°30 E.-NE cor. sec. 8	20	12	2	" 10, '13	18 48.7	G. A. Bennett.
At " 31	47	14	2	July 26, '13	22 33.2	R. C. Purser.
30°00 N.- " 18	42	16	2	June 6, '13	19 31.0	"
10°00 E.- " 31	13	18	2	Nov. 10, '13	17 55.8	G. A. Bennett.
At " 22	40	18	2	" 19, '13	20 10.0	R. Neelands.
At Sta. 4, sec. 16	7	19	2	Sept. 15, '13	18 24.9	C. Rinfret.
39°00 N.-NE cor. sec. 8	23	19	2	Oct. 13, '13	19 23.9	B. H. Segre.
40°00 W.- " 22	25	19	2	" 23, '13	35.5	"
At Sta. 2, sec. 33	4	20	2	" 11, '13	17 07.0	C. Rinfret.
" 33	4	20	2	" 12, '13	10.3	"
At Sta. 3, sec. 22	5	20	2	Sept. 25, '13	13 02.3	"
" 22	5	20	2	" 26, '13	17 56.0	"
At Sta. 4, sec. 31	7	20	2	Nov. 13, '13	18 36.3	"
At Sta. 78A sec. 6	3	21	2	Sept. 11, '13	03.6	"
At Sta. 2, sec. 24	3	21	2	Oct. 12, '13	17 45.1	"
At Sta. 3, sec. 22	4	21	2	" 15, '13	54.4	"
" 22	4	21	2	" 21, '13	57.0	"
At Sta. 3, sec. 15	5	21	2	" 1, '13	46.5	"
At Sta. 2, sec. 10	6	21	2	" 31, '13	18 07.9	"
At Sta. 3, sec. 18	7	21	2	" 31, '13	19.1	"
" 18	7	21	2	Nov. 6, '13	16.0	"
At Sta. 2, sec. 28	2	22	2	Sept. 6, '13	32.6	"
At Sta. 12, sec. 28	5	22	2	Aug. 16, '13	45.7	"
At Sta. 6, sec. 28	5	22	2	" 22, '13	52.4	"
At Sta. 2, sec. 17	6	22	2	" 28, '13	40.3	"
" 6	6	22	2	" 30, '13	38.3	"
15°00 N.-NE cor. sec. 9	20	22	2	May 22, '13	19 59.0	B. H. Segre.
19°00 S. 14°00 W.-NE cor. sec. 19	21	22	2	Dec. 18, '13	54.0	"
At NE cor. sec. 32	25	22	2	Nov. 8, '13	19 47.2	"
2°00 E.- " 17	44	22	2	Dec. 1, '13	21 17.9	R. Neelands.
0°60 E.- " 20	44	22	2	" 3, '13	16.8	"
40°00 N.- " 14	3	23	2	Aug. 11, '13	19 03.1	C. Rinfret.
At Sta. 3, sec. 29	6	23	2	Nov. 8, '13	18.4	"
40°00 W.-NE cor. sec. 35	21	23	2	Sept. 27, '13	20 09.2	B. H. Segre.
22°00 W.- " 32	22	23	2	" 7, '13	10.6	"
" 32	22	23	2	" 11, '13	07.4	"
40°00 S. } NE " 22	22	23	2	Dec. 5, '13	03.0	"
21°00 E. }						
16°00 S.- " 31	23	23	2	Nov. 26, '13	20 05.5	"
At " 21	38	23	2	July 6, '13	19 40.1	R. Neelands.
1°60 S.- " 22	39	23	2	" 15, '13	25.8	"
40°00 S.- " 30	39	23	2	" 16, '13	48.8	"
Sta. 3, Traverse Lake No. 9	39	23	2	" 28, '13	20 20.3	"
40°00 S.-NE cor. sec. 2	40	23	2	" 22, '13	21.3	"
39°54 W.- " 9	40	23	2	" 26, '13	24.5	"
51°00 W.- " 34	40	23	2	" 30, '13	45.4	"
8°00 SE- " 15	41	23	2	Aug. 18, '13	11.6	"
At Sta. 7, sec. 5	7	24	2	June 10, '13	18 00.1	C. Rinfret.
" 5	7	24	2	" 13, '13	48.3	"



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RESULTS OF MAGNETIC OBSERVATIONS—*Continued.*TABLE I.—DECLINATION OBSERVATIONS—*Continued.*

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
37°00 S.-NE cor. sec. 11.....	18	24	2	May 24, '13	19 33.2	B. H. Segre.
At " 24.....	23	24	2	Sept. 5, '13	20 16.5	"
9°00 W.- " 33.....	24	24	2	Aug. 25, '13	17.3	"
40°00 W.- " 32.....	25	24	2	" 15, '13	19.5	"
36°00 W.- " 11.....	25	24	2	Nov. 17, '13	17.8	"
At $\frac{1}{4}$ cor. E. by sec. 19.....	27	24	2	July 31, '13	49 54.3	R. C. Purser.
6°50 N.-NE cor. sec. 10.....	27	24	2	Aug. 6, '13	20 30.9	B. H. Segre.
30°00 S.- " 11.....	28	24	2	July 21, '13	07.2	"
At " 4.....	39	24	2	Oct. 27, '13	19 57.0	R. Neelands.
40°00 S.- " 2.....	40	24	2	July 5, '13	20 02.5	"
At Sta. 3, Traverse lake No. 1.....	41	24	2	June 27, '13	20 21.1	R. Neelands.
29°00 N.- NE cor. sec. 24.....	42	24	2	Oct. 8, '13	28.4	"
At " 11.....	44	24	2	Dec. 13, '13	12.4	"
At Sta. 62, sec. 15.....	5	25	2	June 18, '13	18 35.8	C. Rinfret.
27°00 N.-						
22°00 W.-NE cor. sec. 8.....	19	25	2	" 2, '13	20 16.8	B. H. Segre.
40°00 S.- " 28.....	26	25	2	July 16, '13	41.6	"
16°00 E.- " 12.....	39	25	2	Nov. 2, '13	53.9	R. Neelands.
At Sta. 7, Traverse lake No. 1.....	40	25	2	May 27, '13	56.3	"
At NE.-cor. sec. 20.....	41	25	2	June 7, '13	12.2	"
At Sta. 2, Sec. 18.....	4	26	2	Aug. 1, '13	18 08.1	C. Rinfret.
At " 18.....	4	26	2	" 4, '13	10.4	"
At Sta. 5, sec. 35.....	5	26	2	June 2, '13	17 57.3	"
At " 35.....	5	26	2	June 3, '13	53.1	"
At Sta 8, sec. 13.....	5	26	2	" 21, '13	18 26.9	"
10°00 N.-						
14°00 W.-NE cor. sec. 4.....	20	26	2	" 15, '13	20 11.7	B. H. Segre.
At " 10.....	40	26	2	" 7, '13	21.6	R. Neelands.
At " 32.....	22	27	2	July, 5, '13	26.1	B. H. Segre.
At " 10.....	25	27	2	Aug. 4, '13	19 33.4	R. C. Purser.
6°50 E.- " 33.....	25	27	2	July 12, '13	20 26.8	B. H. Segre.
At Sta. 141, sec. 26.....	6	28	2	" 1, '13	19 35.2	C. Rinfret.
At Sta. 5, Traverse lake Johnston.....	12	28	2	" 3, '12	31.5	"
At Sta. 14, Traverse lake No. 3.....	46	28	2	Dec. 27, '13	24 01.7	R. Neelands.
40°00 S.-NE cor. sec. 10.....	46	28	2	" 29, '13	25 13.9	"
At Sta. 75, sec. 15.....	3	29	2	July 24, '13	19 28.3	C. Rinfret.
At Sta. 2A, sec. 10.....	4	29	2	" 16, '13	21.3	"
At Sta. 2, sec. 23.....	6	29	2	" 7, '13	46.5	"
At Sta. 2A, sec. 23.....	6	29	2	" 8, '13	45.4	"
35°00 W.-NE cor. sec. 33.....	14	29	2	Nov. 10, '13	44.8	W. J. Deans.
At Sta. 60, sec. 24.....	3	30	2	July 17, '13	05.1	C. Rinfret.
At " 24.....	3	30	2	" 19, '13	03.5	"
35°00 S.-NE cor. sec. 36.....	16	30	2	" 7, '13	59.6	G. A. Bennett.
At " 36.....	16	30	2	" 7, '13	58.6	"
At NE cor. sec. 14.....	18	1	3	Oct. 23, '13	20 47.4	"
At " 23.....	18	1	3	" 25, '13	43.5	"
2°00 N.-NE cor. sec. 23.....	15	2	3	May 25, '13	32.9	"
At " 23.....	15	2	3	" 31, '13	27.2	"
40°00 E.- " 34.....	15	2	3	June 26, '13	41.4	"
" 34.....	15	2	3	" 26, '13	39.5	"
" 34.....	15	2	3	July 5, '13	37.0	"
45°00 S.- " 2.....	16	2	3	May 29, '13	35.5	"
36°00 S.- " 20.....	16	2	3	Sept. 9, '13	21 24.4	C. E. Johnston.
At " 17.....	16	2	3	" 19, '13	24.3	"
40°00 S.- " 19.....	16	2	3	" 24, '13	18.2	"
50°00 N.- " 10.....	57	2	3	Dec. 15, '13	23 33.7	E. W. Hubbell.
40°00 S.- " 23.....	16	3	3	Sept. 11, '13	21 14.1	C. E. Johnston
At " 23.....	16	3	3	" 12, '13	12.5	"
At " 34.....	17	3	3	" 1, '13	17.5	"
40°00 S.- " 15.....	18	3	3	" 4, '13	21.1	"
40°00 S.- " 22.....	18	3	3	" 5, '13	25.1	"
" 22.....	18	3	3	" 5, '13	12.5	"
40°00 W.- " 34.....	18	3	3	" 28, '13	20 55.5	"
At " 3.....	19	3	3	" 27, '13	55.1	"



## SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS—*Continued.*TABLE I.—DECLINATION OBSERVATIONS—*Continued.*

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
40° 00 N.-NE. cor. sec. 3.	19	3	3	Oct., 6, '13	57° 6	C. E. Johnston.
40° 00 S.-	12.	21	3	" 7, '13	20 39° 8	"
" 12.	21	3	3	" 11, '13	34° 6	"
" 12.	21	3	3	" 12, '13	37° 9	"
" 12.	21	3	3	" 13, '13	36° 9	"
" 12.	21	3	3	" 14, '13	36° 7	"
" 12.	21	3	3	" 15, '13	36° 8	"
" 12.	21	3	3	" 19, '13	34° 9	"
0° 50 N.-	28.	30	3	May 30, '13	51° 4	R. C. Purser.
At " 9.	30	3	3	June 2, '13	36° 2	"
At " 19.	17	4	3	July 3, '13	21 13° 3	C. E. Johnston.
At " 19.	17	4	3	" 5, '13	15° 7	"
At " 19.	17	4	3	" 6, '13	18° 3	"
40° 00 S.-	20.	17	4	" 6, '13	18° 9	"
40° 00 W.-NE. cor. sec. 9.	18	4	3	Aug. 20, '13	21 16° 1	C. E. Johnston.
40° 00 W.-	2.	19	4	Sept. 30, '13	06° 0	"
40° 00 W.-	2.	19	4	Oct. 1, '13	09° 9	"
14° 75 N.-	7.	57	4	Dec. 10, '13	32° 5	E. W. Hubbell.
15° 00 S.-	36.	13	5	May 28, '13	20 40° 0	G. A. Bennett.
At Sta. 53 Chaplin lake trav. sec. 27.	16	5	3	July 17, '13	21 12° 3	C. E. Johnston.
At NE. cor. sec. 12.	16	5	3	" 18, '13	10° 6	"
At " 12.	16	5	3	" 19, '13	14° 6	"
At " 12.	16	5	3	" 20, '13	13° 0	"
At " 12.	16	5	3	" 21, '13	14° 4	"
At " 12.	16	5	3	" 21, '13	13° 8	"
40° 00 E.-NE. cor. sec. 32.	17	5	3	June 28, '13	06° 8	"
40° 00 E.-	32.	17	5	" 30, '13	09° 2	"
40° 00 E.-	32.	17	5	July 1, '13	07° 3	"
At Sta. 34 Chaplin lake trav. sec. 1.	17	5	3	" 8, '13	16° 4	"
" " "	17	5	3	" 8, '13	17° 0	"
40° 00 S.-NE. cor. sec. 1.	17	5	3	" 10, '13	14° 4	"
40° 00 S.-	1.	17	5	" 12, '13	30° 8	"
40° 00 S.-	1.	17	5	" 15, '13	13° 0	"
40° 00 S.-	1.	17	5	" 16, '13	16° 2	"
42° 00 S.-	17.	17	5	" 22, '13	13° 7	"
42° 00 S.-	17.	17	5	" 23, '13	16° 3	"
At Sta. 60 Chaplin lake trav. sec. 3	17	5	3	" 24, '13	17° 6	"
10° 00 S.-NE. cor. sec. 8.	25	5	3	Nov. 27, '13	15° 8	G. A. Bennett.
At N.E. " 36.	47	5	3	Oct. 30, '13	22 39° 9	R. C. Purser.
75° 84 W.-	19.	54	5	May 29, '13	20 27° 9	P. R. A. Belanger.
22° 45 W.-	21.	54	5	June 9, '13	19 45° 4	"
31° 90 N.-	21.	55	5	" 3, '13	47° 6	"
0° 15 S.-	9.	56	5	" 4, '13	20 22° 4	"
At NE. cor. sec. 7.	57	5	3	Dec. 8, '13	20 42° 0	E. W. Hubbell.
41° 00 N.-NE. cor. sec. 10.	20	6	3	June 16, '13	21 33° 4	C. E. Johnston.
41° 00 N.-	10.	20	6	" 17, '13	21 35° 2	"
41° 00 N.-	10.	20	6	" 18, '13	34° 6	"
1° 00 N.-	29.	25	6	Nov. 20, '13	38° 5	G. A. Bennett.
4° 00 N.-	14.	25	6	" 22, '13	45° 9	"
4° 00 N.-	14.	25	6	Dec. 6, '13	31° 0	"
At NE. cor. sec. 10.	33	6	3	" 31, '13	40° 9	R. C. Purser.
15° 00 E. $\frac{1}{2}$ cor. N. by sec. 9.	42	6	3	June 26, '13	20 27° 5	"
25° 17 S.-N.E. cor. sec. 13.	15	7	3	" 5, '13	22 13° 1	C. E. Johnston.
25° 17 S.-	13.	15	7	" 6, '13	21 57° 7	"
At NE. cor. sec. 31.	17	7	3	" 1, '13	56° 8	"
At " 31.	17	7	3	" 2, '13	22 19° 0	"
At " 19.	27	8	3	Oct. 24, '13	00° 4	"
At " 18.	27	8	3	" 26, '13	21 58° 0	"
At SE. " 2.	23	9	3	Dec. 3, '13	57° 8	G. A. Bennett.
27° 50 S.-NE. cor. sec. 35.	24	9	3	" 25, '13	52° 1	C. E. Johnston.
27° 50 S.-	35.	24	9	" 29, '13	55° 3	"
At Sta. 6, Red Deer lake B. trav. sec. 7	28	9	3	Oct. 31, '13	22 14° 0	"
At NE. cor. sec. 8.	28	9	3	Nov. 1, '13	18° 3	"
At " 8.	28	9	3	" 2, '13	19° 2	"



RESULTS OF MAGNETIC OBSERVATIONS—*Continued.*TABLE I.—DECLINATION OBSERVATIONS—*Continued.*

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
At NE. cor. sec. 8.	28	9	3	" 4, '13	16.5	C. E. Johnston
40° 00' W.-NE. cor. sec. 33.	27	10	3	" 3, '13	21 59.5	"
At NE. " 31.	27	10	3	" 8, '13	22.5	"
At " 31.	27	10	3	" 10, '13	56.6	"
8° 00' W.-NE. cor. sec. 31	27	10	3	" 12, '13	54.7	"
8° 00' W.- " 31.	27	10	3	" 16, '13	58.3	"
40° 00' N.- " 2	28	10	3	" 2, '13	22 12.0	"
24° 35' S.-1° 50' E.-NE. cor. sec. 23, Sta. 17, Red Deer lake F trav.	28	11	3	" 14, '13	21 26.3	"
At NE. cor. sec. 30.	26	12	3	May 26, '13	20 11.6	R. C. Purser.
At Sta. 3 trav. of Lake A, 13° 00' E. 11° 00' N.-NE. cor. sec. 34.	31	12	3	Sept. 30, '13	21 46.5	E. P. Bowman.
11° 50' S.-N.E. cor. sec. 33.	54	12	3	Nov. 12, '13	24 45.0	P. R. A. Belanger.
24° 00' S.- " 10.	55	12	3	" 3, '13	28.3	"
At NE cor. sec. 7.	56	12	3	Nov. 22, '13	25 30.8	P. R. A. Belanger.
40° 00' S.- " 3.	29	13	3	Sept. 29, '13	22 07.5	E. P. Bowman.
4° 00' N.- " 5.	30	13	3	" 27, '13	21 34.8	"
35° 00' N.- " 9.	31	13	3	Oct. 3, '13	22 41.5	"
At NE cor. sec. 16.	34	13	3	" 31, '13	11.2	"
40° 00' S.- " 21.	35	13	3	Nov. 14, '13	27.6	"
22° 50' N.- " 17.	53	13	3	Aug. 28, '13	23 46.9	P. R. A. Belanger.
At ½ sec. cor. N by sec. 24	54	13	3	Nov. 17, '13	25 08.1	"
At NE cor. sec. 10.	56	13	3	" 23, '13	49.3	"
40° 00' S.- " 18.	31	14	3	Oct. 4, '13	23 40.9	E. P. Bowman.
At " 9.	33	14	3	" 9, '13	17.5	"
At " 32.	34	14	3	" 18, '13	22 46.0	"
At " 32.	34	14	3	" 23, '13	26.8	"
10° 00' S.- " 21.	36	14	3	Nov. 19, '13	23 34.2	"
10° 00' S.- " 21.	36	14	3	" 21, '13	25.8	"
50° 00' W.- " 32.	23	15	3	Oct. 20, '13	21 48.0	G. A. Bennett.
20° 00' S.- " 15.	30	15	3	Sept. 26, '13	22 49.6	E. P. Bowman.
3° 00' S.- " 10.	32	15	3	" 25, '13	23 43.3	"
3° 00' S.- " 10.	32	15	3	" 25, '13	44.5	"
3° 00' S.- " 10.	32	15	3	" 25, '13	45.6	"
40° 00' S.- " 7.	34	15	3	Oct. 16, '13	03.8	"
22° 00' W.- " 34.	68	15	3	Apr. 8, '13	25 47.6	A. Saint Cyr.
22° 00' W.- " 34.	68	15	3	" 8, '13	47.7	"
19° 00' N.- " 24.	23	16	3	Oct. 18, '13	21 59.6	G. A. Bennett.
40° 00' W.- " 10.	31	16	3	Sept. 20, '13	23 34.7	E. P. Bowman.
25° 00' W.- " 33.	32	16	3	" 24, '13	22 40.8	"
11° 00' N.-½ sec. cor. E by sec. 18	63	16	3	Aug. 17, '13	26 17.3	P. R. A. Belanger.
3° 00' W.-NE cor. sec. 31.	68	16	3	Apr. 7, '13	24 56.7	A. Saint Cyr.
3° 00' W.- " 31.	68	16	3	" 7, '13	24 57.2	"
36° 00' W.- " 33.	68	17	3	Jan. 25, '13	24 51.8	"
4° 00' W.- " 33.	68	17	3	" 26, '13	25 01.4	"
4° 00' W.- " 33.	68	17	3	" 26, '13	24 55.3	"
69° 00' W.- " 32.	68	17	3	" 27, '13	25 13.4	"
35° 40' W.-NE cor. sec. 20	18	18	3	May 21, '13	21 46.2	G. A. Bennett.
20° 00' S.- " 4.	28	18	3	Sept. 14, '13	23 13.2	E. P. Bowman.
40° 00' S.- " 4.	28	18	3	" 15, '13	02.8	"
25° 00' W.- " 22.	30	18	3	" 17, '13	12.5	"
20° 00' S.- " 27.	32	18	3	" 2, '13	22 18.6	"
At " 3.	33	18	3	" 2, '13	32.2	"
18° 00' S.- " 15.	34	18	3	Aug. 31, '13	55.9	"
At Sta. 4 traverse of Lake Eins,						
7° 61' W.-E. by sec. 33	35	18	3	June 18, '13	22 15.4	"
25° 00' S.-NE cor. sec. 14.	35	18	3	" 26, '13	23 49.4	"
At " 20.	37	18	3	" 12, '13	24 25.9	"
At Sta. 38, traverse of Aroma Lake, 30° 00' S.-N. by sec. 31.	38	18	3	June 6, '13	23 38.7	"
46° 00' W.-NE cor. sec. 35.	68	18	3	Jan. 31, '13	25 04.9	A. Saint Cyr.
30° 00' W.- " 31.	68	18	3	Feb. 5, '13	26 14.1	"
35° 00' N.- " 29.	28	19	3	Sept. 11, '13	22 29.6	E. P. Bowman.
At " 34.	29	19	3	" 12, '13	31.2	"



SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS—*Continued.*TABLE I.—DECLINATION OBSERVATIONS—*Continued.*

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
15°00 S.-NE. cor. sec. 5.....	29	19	3	Sept. 12, '13	30°1	E. P. Bowman.
20°00 N.-" 16.....	32	19	3	" 3, '13	21 41°1	"
2°00 S.-" 9.....	33	19	3	Aug. 27, '13	22 59°3	"
21°00 S.-" 17.....	35	19	3	July 7, '13	53°8	"
At " 23.....	36	19	3	June 17, '13	23 45°6	"
22°00 N.-" 20.....	39	19	3	July 16, '13	21 19°3	R. C. Purser.
17°81 W.-" 22.....	39	19	3	" 18, '13	34°2	"
32°00 S.-" 13.....	39	19	3	May 28, '13	23 19°5	E. P. Bowman.
40°00 S.-" 22.....	40	19	3	Aug. 11, '13	21 59°1	"
15°00 S.-" 18.....	41	19	3	Aug. 10, '13	23 51°4	"
57°00 W.-" 36.....	68	19	3	Feb. 6, '13	27 26°0	A. Saint Cyr.
At SE cor. sec. 57° E.-NE cor. sec. 34.....	68	19	3	" 8, '13	15°8	"
31°00 N.-" 34.....	68	19	3	" 9, '13	08°0	"
31°00 N.-" 34.....	68	19	3	" 9, '13	18°6	"
31°00 N.-" 34.....	68	19	3	" 9, '13	13°6	"
9°00 N.-NE cor. sec. 17.....	30	20	3	Sept. 8, '13	21 05°1	E. P. Bowman.
At SE cor. sec. 6.....	31	20	3	Sept. 6, '13	21 10°6	"
At NE cor. sec. 17.....	34	20	3	Aug. 22, '13	22 57°0	"
At Sta. 37 traverse of Tramping lake, 18°00 S., 40°00 W.-NE cor. sec. 21.....	35	20	3	July 12, '13	53°8	"
At Sta. 54, traverse of Tramping lake, 26°00 S., 24°00 W.-NE cor. sec. 17.....	36	20	3	July 15, '13	33°6	"
40°00 N.-NE cor. sec. 30.....	36	20	3	Aug. 15, '13	38°8	"
At Sta. 157, traverse of Tramping lake, 27°00 E., 17°00 S.-NE cor. sec. 30.....	36	20	3	Aug. 16, '13	47°1	"
5°00 E.-" 19.....	37	20	3	July 20, '13	46°9	"
At Sta. 127, traverse of Tramping lake, 27°00 S.-11°00 W.-NE cor. sec. 30.....	37	20	3	July 23, '13	50°1	"
At Sta. 99, traverse of Tramping lake, 24°00 N.-17°00 W.-NE cor. sec. 8.....	38	20	3	July 19, '13	33°3	"
40°00 S.-NE cor. sec. 8.....	39	20	3	July 28, '13	23 36°5	"
33°00 S. " " 16.....	40	20	3	July 31, '13	49°3	"
7°00 N. " " 16.....	41	20	3	Aug. 1, '13	24 29°4	"
45°00 W. " " 32.....	68	20	3	April 5, '13	25 32°0	A. Saint Cyr.
At " " 12.....	15	21	3	Nov. 14, '13	22 29°0	G. C. Cowper.
1°00 W. " " 24.....	31	21	3	Sept. 6, '13	03°3	E. P. Bowman.
10°00 S. " " 17.....	33	21	3	Aug. 25, '13	50°7	"
3°00 S. " " 27.....	35	21	3	Aug. 20, '13	35°1	"
9°00 N. " " 16.....	39	21	3	Aug. 13, '13	24 18°1	"
40°00 W. " " 9.....	47	21	3	Nov. 27, '13	25 53°1	"
16°00 S. " " 21.....	62	21	3	July 19, '13	26 00°6	P. R. A. Belanger.
25°00 W. " " 33.....	68	21	3	Feb. 25, '13	25 40°0	A. Saint Cyr.
16°00 W. " " 35.....	68	21	3	Feb. 22, '13	05°7	"
32°00 S. " " 21.....	12	22	3	Dec. 8, '13	21 55°1	G. C. Cowper.
At Sta. 73, traverse Crane lake, sec. 30	13	22	3	Nov. 7, '13	22 18°6	"
At NE cor. sec. 11.....	13	22	3	Dec. 1, '13	11°3	"
40°00 W. " " 33.....	16	22	3	Dec. 15, '13	05°5	"
At Sta. 7, traverse Lake No. 2, sec. 34	16	22	3	Dec. 17, '13	22 15°0	"
20°00 E.-NE. cor. sec. 36.....	47	22	3	Nov. 29, '13	25 36°2	E. P. Bowman.
At Sta. 3, traverse of lake in sec. 7, R. 21						
28°33 S., 1°71 E.-NE cor. sec. 12.....	47	22	3	Dec. 5, '13	43°4	"
40°00 S.-NE cor. sec. 21.....	47	22	3	Dec. 9, '13	24 47°6	"
20°00 S.-NE cor. sec. 19.....	61	22	3	July 3, '13	25 20°7	P. R. A. Belanger.
42°00 S. $\frac{1}{2}$ sec. cor. E. by sec. 15.....	62	22	3	July 15, '13	35°1	"
40°00 W.-NE cor. sec. 34.....	68	22	3	Mar. 1, '13	26 56°3	A. Saint Cyr.
40°00 W.-NE cor. sec. 34.....	68	22	3	Mar. 2, '13	26 57°9	"
33°50 W.-NE cor. sec. 31.....	68	22	3	Mar. 3, '13	41°7	"
33°50 W.-NE cor. sec. 31.....	68	22	3	Mar. 4, '13	45°0	"
33°50 W.-NE cor. sec. 31.....	68	22	3	Mar. 4, '13	28°6	"
At Sta. 36, traverse Crane lake, sec. 5.	13	23	3	Nov. 1, '13	22 34°4	G. C. Cowper.
At Sta. 31, traverse Crane lake, sec. 6.	13	23	3	Nov. 2, '13	39°9	"
At Sta. 4, traverse Lake 1, sec. 36.....	14	23	3	Nov. 26, '13	16°3	"
At NE cor. sec. 17.....	50	23	3	Aug. 10, '13	23 59°9	R. C. Purser.
At NE cor. sec. 11.....	61	23	3	July 9, '13	25 39°1	P. R. A. Belanger.



RESULTS OF MAGNETIC OBSERVATIONS—*Continued.*TABLE I.—DECLINATION OBSERVATIONS—*Continued.*

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
At NE cor. sec. 24.....	62	23	3	July 21, '13	44° 5'	P. R. A. Bélanger.
2° 37' W. $\frac{1}{4}$ sec. cor. S. by sec. 4.....	63	23	3	July 30, '13	46° 1'	"
2° 00' W.-NE cor. sec. 36.....	68	23	3	Mar. 4, '13	26° 35' 5"	A. Saint Cyr.
17° 00' W.-NE cor. sec. 36.....	68	23	3	Mar. 5, '13	37° 9'	"
40° 00' W.-NE cor. sec. 35.....	68	23	3	Mar. 5, '13	58° 2'	"
At Sta. 5, traverse of Crane lake, sec. 22	13	24	3	Oct. 30, '13	22° 20' 0"	G. C. Cowper.
At Sta. 27A traverse of Big Stick lake, sec. 20.....	15	24	3	Oct. 18, '13	47° 1'	"
At NE cor. sec. 12.....	40	24	3	Oct. 20, '13	23° 39' 3"	R. C. Purser.
73° 00' W.-NE cor. sec. 36.....	68	24	3	April 3, '13	25° 50' 4"	A. Saint Cyr.
At NE. cor. sec. 8.....	15	25	3	Oct. 17, '13	22° 38' 5"	G. C. Cowper.
At NE cor. sec. 22.....	34	25	3	Oct. 15, '13	23° 11' 1"	R. C. Purser.
10° 00' E. " 22.....	34	25	3	" 16, '13	09° 0'	"
40° 00' W. " 21.....	13	26	3	Sept. 26, '13	22° 23' 9"	G. C. Cowper.
40° 00' W. " 21.....	13	26	3	" 28, '13	21° 25' 6"	"
53° 50' W. " 34.....	68	26	3	Mar. 16, '13	26° 10' 0"	A. Saint Cyr.
53° 50' W. " 34.....	68	26	3	" 16, '13	16° 8'	"
53° 50' W. " 34.....	68	26	3	" 16, '13	09° 3'	"
26° 00' W. " 32.....	68	26	3	Mar. 25, '13	27° 0'	"
53° 00' W. " 34.....	68	26	3	" 26, '13	31° 8'	"
53° 00' W. " 34.....	68	26	3	" 26, '13	19° 7'	"
53° 00' W. " 34.....	68	26	3	" 26, '13	24° 8'	"
53° 00' W. " 34.....	68	26	3	" 27, '13	24° 7'	"
53° 00' W. " 34.....	68	26	3	" 27, '13	21° 4'	"
53° 00' W. " 34.....	68	26	3	" 27, '13	20° 9'	"
21° 00' W. " 31.....	68	26	3	April 5, '13	56° 5'	"
At $\frac{1}{4}$ cor. E. by sec. 22.....	51	27	3	Oct. 10, '13	23° 54' 0"	R. C. Purser.
At $\frac{1}{4}$ cor. S. by sec. 2.....	51	27	3	July 3, '13	41° 2'	"
50° 27' E.-NE. cor. sec. 35.....	6	30	3	June 23, '13	22° 34' 1"	A. M. Narraway.
50° 46' S. " 29.....	6	30	3	" 24, '13	25° 5'	"
48° 00' S. " 33.....	6	30	3	July 4, '13	04° 2'	"
At " 11.....	6	30	3	" 9, '13	18° 8'	"
At " 22.....	7	30	3	June 26, '13	21° 17' 3"	"
57° 69' N. " 11.....	7	30	3	July, 2, '13	53° 2'	"
79° 80' N. " 15.....	7	30	3	" 7, '13	54° 0'	"
At " 22.....	29	30	3	Sept. 9, '13	22° 31' 9"	E. P. Bowman.
At Sta. 7, Traverse lake, No. 2, sec. 34.....	16	1	4	" 11, '13	23° 09' 5"	G. C. Cowper.
2° 90' S.-NE cor. sec. 36.....	68	1	4	Mar. 25, '13	27° 20' 6"	A. Saint Cyr.
56° 92' W. " 33.....	84	1	4	" 18, '13	29° 54' 0"	G. H. Blanchet.
27° 07' W. " 31.....	96	1	4	Sept. 15, '13	30° 07' 3"	J. B. McFarlane.
At " 5.....	1	2	4	June 24, '13	22° 18' 0"	G. C. Cowper.
76° 24' W. " 32.....	84	2	4	Mar. 25, '13	29° 20' 7"	G. H. Blanchet.
40° 00' W. " 35.....	96	2	4	Sept. 16, '13	36° 1'	J. B. McFarlane.
24° 00' E. " 35.....	5	3	4	" 24, '13	21° 30' 5"	A. M. Narraway.
19° 00' N. " 32.....	5	3	4	Oct. 1, '13	29° 3'	"
34° 00' E. " 32.....	5	3	4	" 2, '13	36° 1'	"
8° 00' N. " 20.....	6	3	4	Sept. 27, '13	33° 9'	"
40° 00' N. " 22.....	6	3	4	Oct. 3, '13	20° 9'	"
At $\frac{1}{4}$ cor. E. by sec. 25.....	8	3	4	June 15, '13	22° 35' 0"	G. C. Cowper.
At NE cor. sec. 1.....	14	3	4	Sept. 14, '13	23° 08' 4"	"
25° 46' W. " 33.....	84	3	4	Mar. 30, '13	27° 25' 9"	G. H. Blanchet.
22° 12' N. " 34.....	5	4	4	Sept. 15, '13	21° 43' 0"	A. M. Narraway.
15° 00' E. " 21.....	6	4	4	" 8, '13	58° 0'	"
40° 50' E. " 20.....	6	4	4	Sept. 10, '13	22° 10' 5"	"
15° 00' E. " 7.....	6	4	4	" 12, '13	09° 0'	"
At $\frac{1}{4}$ cor. N. by sec. 7.....	9	4	4	June 3, '13	45° 0'	G. C. Cowper.
1° 00' E.-NE cor. sec. 33.....	19	4	4	Aug. 26, '13	23° 01' 3"	"
76° 24' W. " 36.....	84	4	4	April 3, '13	29° 54' 5"	G. H. Blanchet.
72° 00' W. " 33.....	84	4	4	" 9, '13	27° 6'	"
30° 00' W. " 32.....	5	5	4	July 18, '13	22° 26' 1"	A. M. Narraway.
50° 00' S. " 26.....	6	5	4	" 14, '13	22° 8'	"
40° 00' S. " 2.....	6	5	4	" 15, '13	26° 6'	"
20° 00' W. " 22.....	6	5	4	" 16, '13	21° 2'	"



## SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS—*Continued.*TABLE I.—DECLINATION OBSERVATIONS—*Continued.*

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
10°00 N.-NE. cor. sec. 22 .....	6	5	4	July 21, '13	33°0	A. M. Narraway.
76°60 N. " 27 .....	6	5	4	" 21, '13	28°3	"
At " 30 .....	8	5	4	May 29, '13	39°0	G. C. Cowper.
10°00 S. " 30 .....	8	5	4	" 30, '13	47°0	"
At " 14 .....	8	5	4	June 1, '13	42°0	"
8°00 W.-NE cor. sec. 23 .....	17	5	4	Sept. 11, '13	23 04.9	G. A. Bennett.
40°00 S. " 14 .....	17	5	4	" 13, '13	22 56.4	"
40°67 W. " 35 .....	96	5	4	Oct. 18, '13	29 18 1	J. B. McFarlane.
21°17 W. " 36 .....	84	6	4	Apr. 19, '13	30 23 4	G. H. Blanchet.
64°39 W. " 33 .....	92	6	4	June 7, '13	28 59.9	J. B. McFarlane.
2°82 W. " 31 .....	92	6	4	" 10, '13	17°7	"
70°00 W. " 31 .....	92	6	4	" 11, '13	10°0	"
40°00 N. " 5 .....	5	7	4	July 7, '13	22 37.2	G. C. Cowper.
28°73 W. " 32 .....	84	7	4	May 1, '13	29 55.2	G. H. Blanchet.
6°79 W. " 34 .....	92	7	4	June 13, '13	27°5	J. B. McFarlane.
67°41 W. " 31 .....	92	7	4	" 19, '13	30 24.8	"
At " 36 .....	96	7	4	Nov. 6, '13	29 04.9	"
20°00 W. " 31 .....	96	7	4	" 13, '13	30 43.7	"
5°00 N.- $\frac{1}{4}$ cor. E. by sec. 36 .....	3	8	4	July 3, '13	22 19.7	G. C. Cowper.
5°00 N. " 36 .....	3	8	4	" 5, '13	18°7	"
40°00 N.-NE. cor. sec. 7 .....	5	8	4	" 17, '13	44°1	"
At $\frac{1}{4}$ cor. E. by sec. 31 .....	9	8	4	May 22, '13	54°2	"
At " 31 .....	9	8	4	" 24, '13	52°4	"
At NE. cor. sec. 13 .....	21	8	4	Aug. 18, '13	23 43.3	"
" 13 .....	21	8	4	" 19, '13	46°0	"
72°80 W. " 34 .....	84	8	4	May 8, '13	29 47.5	G. H. Blanchet.
10°00 W. " 35 .....	92	8	4	June 21, '13	31 10.2	J. B. McFarlane.
21°64 W. " 32 .....	92	8	4	" 30, '13	30 00.3	"
At " 31 .....	92	8	4	July 2, '13	04°8	"
" 19 .....	2	9	4	Aug. 21, '13	22 27.2	A. M. Narraway.
20°00 N. " 21 .....	2	9	4	" 25, '13	09°0	"
15°00 N. " 15 .....	2	9	4	" 26, '13	22 00.0	"
47°00 N. " 27 .....	2	9	4	" 27, '13	01°2	"
15°00 N. " 11 .....	2	9	4	Sept. 1, '13	21 59.3	"
9°61 E. " 31 .....	18	9	4	Aug. 1, '13	22 55.4	G. A. Bennett.
50°00 W.-SE " 6 .....	19	9	4	" 1, '13	52°3	"
21°00 N. " 4 .....	19	9	4	Oct. 23, '13	23 11.8	A. M. Narraway.
At Sta. 8, Sturgis lake, sec. 18 ..	50	9	4	" 25, '13	25 51.1	G. W. Coltham.
At Sta. 13, Lake No. 1, sec. 26 ..	52	9	4	Aug. 18, '13	26 32.1	"
55°08 W.-NE. cor. sec. 31 .....	84	9	4	May 16, '13	29 43.5	G. H. Blanchet.
34°00 W. " 35 .....	84	9	4	" 13, '13	31 09.2	"
22°41 W. " 32 .....	92	9	4	July 9, '13	29 35.7	J. B. McFarlane.
60°00 W. " 35 .....	96	9	4	Nov. 26, '13	30 32.2	"
40°88 W. " 31 .....	96	9	4	Dec. 2, '13	09°4	"
At " 33 .....	1	10	4	Aug. 16, '13	22 36.0	A. M. Narraway.
49°00 S. " 8 .....	2	10	4	" 11, '13	34°8	"
10°00 E. " 23 .....	2	10	4	" 13, '13	36°7	"
At " 7 .....	2	10	4	" 15, '13	26°2	"
40°00 N. " 5 .....	18	10	4	Oct. 14, '13	23 34.9	"
40°00 E. " 35 .....	18	10	4	July 29, '13	22°8	G. A. Bennett.
At " 33 .....	18	10	4	" 31, '13	19°8	"
7°00 W.-SE. " 2 .....	19	10	4	Aug. 4, '13	22 59.3	"
47°00 W. " 2 .....	19	10	4	" 4, '13	23 11.3	"
49°00 W. " 2 .....	19	10	4	" 4, '13	05°9	"
49°00 W. " 2 .....	19	10	4	" 4, '13	06°7	"
49°00 W. " 2 .....	19	10	4	" 4, '13	08°5	"
60°40 W.-NE. " 31 .....	20	10	4	May 16, '13	05°9	A. M. Narraway.
41°50 N. " 25 .....	21	10	4	" 14, '13	10°4	"
28°00 E. " 32 .....	21	10	4	" 21, '13	19°8	"
1°00 N. " 7 .....	21	10	4	" 26, '13	24°2	"
40°15 N.-SE. " 20 .....	21	10	4	" 28, '13	14°0	"
40°00 S.-NE. " 9 .....	49	10	4	Oct. 31, '13	25 39.1	G. W. Coltham.
12°00 E. " 30 .....	50	10	4	" 23, '13	26 07.5	"
At Sta. 5, Lake No. 2 .....	51	10	4	Aug. 25, '13	13°1	"



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RESULTS OF MAGNETIC OBSERVATIONS—*Continued.*TABLE I.—DECLINATION OBSERVATIONS—*Continued.*

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
65°42' W.-NE. cor. sec. 35.....	92	10	4	July 18, '13	29 25.4	J. B. McFarlane.
20°00' W.-" 31.....	96	10	4	Dec. 15, '13	28 30.4	"
At " 36.....	18	11	4	July 31, '13	23 44.3	G. A. Bennett.
At SE. " 1.....	19	11	4	" 13, '13	45.7	"
23°00' W.-NE cor. sec. 34.....	20	11	4	Nov. 8, '13	23 23.4	A. M. Narraway
62°36' N.-" 13.....	21	11	4	May 20, '13	22 15.5	"
38°00' N.-" 4.....	21	11	4	Nov. 3, '13	23 27.1	"
7°00' N.-" 4.....	21	11	4	" 3, '13	23 28.8	"
At " 11.....	21	11	4	" 7, '13	09.4	"
At Sta. 6, Lake Alice, sec. 9.....	49	11	4	" 1, '13	26 18.6	G. W. Coltham
50°00' S.-NE. cor. sec. 5.....	50	11	4	Sept. 30, '13	14.8	"
At Sta. 225, Birch lake, sec. 34.....	50	11	4	Oct. 13, '13	25 59.2	"
At Sta. 8, Lake 3, sec. 19.....	51	11	4	Aug. 27, '13	26 15.8	"
At Sta. 4, Lake 6, sec. 19.....	52	11	4	July 22, '13	22.5	"
10°00' N.-NE cor. sec. 11.....	52	11	4	Aug. 1, '13	20.8	"
15°00' W.-" 34.....	84	11	4	May 26, '13	30 00.8	G. H. Blanchet
15°00' " 34.....	84	11	4	" 26, '13	29 41.5	"
38°60' W.-" 34.....	92	11	4	Aug. 1, '13	39.7	J. B. McFarlane
60°00' W.-" 32.....	96	11	4	Dec. 29, '13	46.0	"
4°00' S.-" 10.....	21	12	4	Nov. 14, '13	23 18.4	A. M. Narraway
20°00' E.-" 33.....	21	12	4	" 21, '13	18.2	"
At Sta. 18, Lake Thomas.....	47	12	4	" 12, '13	26 02.7	G. W. Coltham
17°00' N.-NE cor. sec. 8.....	48	12	4	" 17, '13	10.5	"
At Sta. A, Lake No. 2.....	48	12	4	" 17, '13	14.7	"
50°00' N.-NE cor. sec. 36.....	49	12	4	Sept. 29, '13	11.8	"
At Sta. 2, Lake No. 1.....	49	12	4	Nov. 7, '13	15.9	"
64°00' S.-NE cor. sec. 17.....	50	12	4	Sept. 23, '13	07.3	"
10°00' S.-" 17.....	50	12	4	" 24, '13	10.8	"
At Sta. 77, Birch lake.....	50	12	4	" 27, '13	07.5	"
At Station 3, Lake V.....	51	12	4	" 15, '13	16.8	"
5°00' N.-NE cor. sec. 18.....	52	12	4	June 11, '13	21.3	"
At Sta. 2, Lake A, sec. 11.....	52	12	4	July 5, '13	24.4	"
At Sta. 9, Lake S, sec. 11.....	52	12	4	" 17, '13	20.5	"
18°20' W.-NE cor. sec. 31.....	84	12	4	June 5, '13	29 43.1	G. H. Blanchet
At Sta. 4, Traverse, Indian lake, sec. 9.....	55	13	4	July 22, '13	22 38.2	G. C. Cowper
At Sta. 3, Lake A, Sec. 13.....	51	13	4	Sept. 18, '13	26 13.3	G. W. Coltham
14°00' S.-NE cor. sec. 16.....	52	13	4	May 31, '13	96.1	"
45°20' W., 60°00' N.-NE cor. sec. 9.....	52	13	4	June 5, '13	03.0	"
At SE cor. sec. 2.....	3	14	4	July 30, '13	22 48.0	A. M. Narraway
9°00' W.-SE cor. sec. 5.....	3	15	4	" 29, '13	30.0	"
5°00' F.-" 4.....	3	15	4	Aug. 1, '13	23 09.2	"
3°84' N.-" 3.....	3	15	4	" 5, '13	22 03.5	"
At NE " 9.....	32	15	4	Oct. 15, '13	24 40.7	J. B. Saint Cyr
0°50' N.-" 10.....	9	16	4	" 15, '13	23 15.0	G. A. Bennett
" " 10.....	9	16	4	" 15, '13	12.8	"
At ½ cor. E. by sec. 9.....	34	16	4	" 22, '13	24 44.6	J. B. Saint Cyr
" " 16.....	34	17	4	" 14, '13	27.3	"
At NE cor. sec. 34.....	35	17	4	" 11, '13	28.6	"
At ½ cor. E. by sec. 23.....	37	17	4	" 3, '13	52.8	"
At NE cor. sec. 22.....	38	17	4	Nov. 8, '13	57.2	"
60°00' S.-" 25.....	38	17	4	" 10, '13	25 01.9	"
At ½ cor. E. by sec. 1.....	34	18	4	Sept. 24, '13	24 40.4	"
At NE cor. sec. 9.....	35	18	4	" 19, '13	30.4	"
At ½ cor. N. by sec. 35.....	35	18	4	" 23, '13	47.6	"
At NE cor. sec. 14.....	36	18	4	" 29, '13	55.0	"
At " 8.....	37	18	4	Nov. 5, '13	55.6	"
At ½ cor. E. by sec. 32.....	37	18	4	" 6, '13	25 18.3	"
20°00' S.-NE cor. sec. 19.....	37	18	4	" 7, '13	07.0	"
At ½ cor. E. by sec. 17.....	36	19	4	Oct. 25, '13	24 52.5	"
At " 30.....	36	19	4	" 30, '13	25 19.1	"
At NE cor. sec. 27.....	36	19	4	" 31, '13	15.6	"
At " 4.....	37	19	4	Nov. 1, '13	03.9	"
At " 5.....	37	19	4	" 3, '13	24 42.5	"
" " 5.....	37	19	4	" 4, '13	25 09.1	"



## SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS—*Continued.*TABLE I.—DECLINATION OBSERVATIONS—*Continued.*

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
At NE. cor. sec. 11.	38	19	4	Nov. 13, '13	08.5	J. B. Saint Cyr.
41°00 S.- " 10	38	19	4	" 13, '13	10.5	"
60°00 N.- " 22	73	19	4	" 2, '13	29 06.2	C. F. Miles
60°00 " 22	73	19	4	" 2, '13	28 57.5	"
10°00 N.-NE cor. sec. 15.	73	19	4	Oct. 19, '13	28 54.8	C. F. Miles.
20°00 S.- " 28	31	20	4	Sept. 13, '13	25 04.6	J. B. Saint Cyr.
At $\frac{1}{2}$ sec. cor. W. by sec. 7	37	20	4	Nov. 18, '13	24 40.4	"
At NE cor. sec. 8	37	20	4	" 18, '13	25 05.3	"
At $\frac{1}{2}$ sec. cor. E. by sec. 22	38	20	4	" 15, '13	24 55.0	"
At NE cor. sec. 21	38	20	4	" 22, '13	53.5	"
10°00 W.-NE cor. sec. 34	38	20	4	" 26, '13	44.7	"
78°10 " " 33	84	20	4	Dec. 23, '13	30 08.3	G. H. Blanchet.
6°00 E.- $\frac{1}{2}$ sec. cor. N. by sec. 22	34	21	4	Oct. 25, '13	24 21.6	R. C. Purser.
20°00 S.-17°00 W. $\frac{1}{2}$ sec. cor. N. by sec. 22	34	21	4	" 25, '13	38.5	"
At $\frac{1}{2}$ sec. cor. W. by sec. 26	38	21	4	Nov. 25, '13	25 03.7	J. B. Saint Cyr.
At NE cor. sec. 34	38	21	4	" 28, '13	06.5	"
At " " 27	35	22	4	Aug. 28, '13	24 58.5	"
At $\frac{1}{2}$ sec. cor. E. by sec. 8	35	22	4	" 30, '13	48.2	"
At NE cor. sec. 33	36	22	4	Sept. 6, '13	25 24.4	"
At $\frac{1}{2}$ sec. cor. E. by sec. 28	36	22	4	" 12, '13	33.1	"
At " " 19	36	22	4	" 8, '13	51.7	"
At NE cor. sec. 13	39	22	4	Dec. 19, '13	31.8	"
At " " 31	39	22	4	" 20, '13	23.5	"
At " " 19	35	23	4	Aug. 23, '13	18.1	"
At " " 10	36	23	4	Sept. 5, '13	13.1	"
At " " 21	37	23	4	Dec. 2, '13	23.7	"
5°00 N.-NE cor. sec. 2	37	23	4	" 5, '13	10.9	"
At NE cor. sec. 16	39	23	4	" 2, '13	31.4	"
40°00 E.-NE cor. sec. 20	35	24	4	Aug. 11, '13	10.6	"
At NE cor. sec. 15	35	24	4	" 13, '13	14.6	"
At " " 17	35	24	4	" 16, '13	18.9	"
At $\frac{1}{2}$ sec. cor. E. by sec. 23	37	24	4	Dec. 8, '13	19.0	"
At NE cor. sec. 9	37	24	4	" 9, '13	23.7	"
12°09 E.-NE cor. sec. 35	1	25	4	Oct. 8, '13	23 36.4	G. A. Bennett.
At Sta. 6, traverse of St. Mary's river,						
27°00 E., 42°00 N. SE cor. sec. 2	2	25	4	" 11, '13	23 35.4	"
At $\frac{1}{2}$ sec. cor. E. by sec. 9	35	25	4	Aug. 7, '13	25 09.2	J. B. Saint Cyr.
At SE cor. sec. 9	37	25	4	Dec. 13, '13	32.3	"
At NE " 21	37	25	4	" 11, '13	24.0	"
At " " 32	41	25	4	June 24, '13	26 05.6	"
At SW " 3	35	26	4	Aug. 3, '13	25 12.9	"
At NE " 11	36	26	4	July 31, '13	50.4	"
39°00 S.-NE cor. sec. 31	40	26	4	June 29, '13	59.6	"
40°00 " " 28	34	27	4	Aug. 4, '13	30.8	"
20°00 " " 15	36	27	4	July 29, '13	08.6	"
At NE cor. sec. 29	39	27	4	" 5, '13	58.2	"
At " " 32	39	27	4	" 6, '13	57.9	"
40°00 S.-NE cor. sec. 34	39	27	4	" 9, '13	26 14.3	"
39°00 E. " 23	39	27	4	" 11, '13	25 48.9	"
8°00 N.- $\frac{1}{2}$ sec. cor. N. by sec. 23	39	27	4	" 14, '13	52.4	"
24°00 " E. " 6	39	27	4	" 18, '13	39.8	"
43°00 W.-NE cor. sec. 29	1	28	4	Aug. 11, '13	23 58.0	G. A. Bennett.
10°00 N.- " 33	36	28	4	July 23, '13	25 27.5	J. B. Saint Cyr.
At NE cor. sec. 22	36	28	4	" 24, '13	27.4	"
At NE cor. sec. 8	36	28	4	" 21, '13	26 35.3	"
40°00 W.-E. by sec. 22 on lake shore	40	28	4	May 23, '13	27 20.4	"
55°20 S.-NE cor. sec. 28	41	28	4	" 21, '13	24 55.8	"
17°00 N.- " 22	42	28	4	June 22, '13	25 26.5	"
13°00 W.- " 26	1	29	4	Aug. 13, '13	24 06.3	G. A. Bennett.
40°00 N.- " 1	2	29	4	" 10, '13	23 51.4	"







SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS—*Continued.*TABLE I.—DECLINATION OBSERVATIONS—*Continued.*

Place.	Township.	Range.	Meridan.	Date.	Declination.	Observer.
At NE. cor. sec. 23.....	9	4	5	Aug. 24, '13	04.2	M. P. Bridgland.
At " 35.....	9	4	5	" 24, '13	03 56.2	"
At $\frac{1}{2}$ cor. N. by. sec. 36.....	9	4	5	" 23, '13	47.4	"
41'00 S.-NE cor. sec. 25.....	10	4	5	Aug. 7, '13	23 03.4	"
At " 24.....	10	4	5	" 7, '13	03.9	"
0'50 S.- " 32.....	16	4	5	July 17, '13	25 00.7	S. L. Evans.
8'00 S.- " 33.....	16	4	5	" 17, '13	01.5	"
20'00 N.- " 10.....	17	4	5	" 5, '13	09.7	"
0'50 N.- " 9.....	17	4	5	" 8, '13	64.2	"
42'00 N.- " 27.....	17	4	5	" 16, '13	08.5	"
0'50 N.- " 28.....	17	4	5	" 16, '13	06.5	"
0'50 S.- " 31.....	17	4	5	" 17, '13	04.3	"
0'50 N.- " 9.....	18	4	5	" 27, '13	02.4	"
60'00 N.- " 8.....	18	4	5	Aug. 3, '13	02.1	"
8'00 W.- " 35.....	18	4	5	" 22, '13	23 33.8	"
38'00 W.- " 35.....	18	4	5	" 23, '13	24 59.8	"
0'50 W.- " 22.....	18	4	5	" 26, '13	25 06.5	"
0'50 S.- " 35.....	19	4	5	Sept. 1, '13	18.5	"
4'50 S.- " 27.....	19	4	5	" 16, '13	01.3	"
32'00 W.- " 30.....	19	4	5	" 26, '13	09.6	G. A. Bennett.
At NE cor. L.S. III, sec. 31.....	19	4	5	" 27, '13	08.5	"
17'00 S.-NE cor. sec. 30.....	20	4	5	" 26, '13	04.9	S. L. Evans.
At " 2.....	12	5	5	July 14, '13	23 46.5	M. P. Bridgland.
At $\frac{1}{2}$ cor. sec. E. by sec 13.....	12	5	5	" 15, '13	45.0	"
71'00 S. NE cor. sec. 18.....	23	5	5	Oct. 12, '13	24 56.2	S. L. Evans.
1'00 N.- " 5.....	23	5	5	" 20, '13	25 00.0	"
31'50 E.- " 31.....	104	10	5	Sept. 22, '13	30 50.1	J. R. Akins.
41'13 E.- " 31.....	104	11	5	" 16, '13	13.3	"
45'50 E.- " 32.....	104	11	5	" 17, '13	16.8	"
5'00 W.- " 34.....	104	11	5	" 18, '13	00.6	"
76'38 E.- " 36.....	104	12	5	" 15, '13	29 56.1	"
18'70 E.- " 34.....	104	12	5	" 12, '13	31 21.7	"
3'00 E.- " 31.....	104	13	5	Aug. 30, '13	33 32.0	"
48'87 E.- " 36.....	104	13	5	Sept. 8, '13	35.5	"
72'79 E.- " 36.....	104	14	5	Aug. 23, '13	34 27.1	"
22'00 E.- " 32.....	104	14	5	" 26, '13	33 34.0	"
6'00 E.- " 35.....	104	14	5	" 28, '13	16.2	"
27'36 E.- " 32.....	104	16	5	" 12, '13	25 10.9	"
39'00 E.- " 33.....	104	16	5	" 13, '13	34 53.0	"
2'00 E.- " 35.....	104	16	5	" 15, '13	53.4	"
67'00 E.- " 35.....	104	16	5	" 16, '13	35.1	"
23'25 E.- " 36.....	104	16	5	" 18, '13	40.6	"
20'00 S.- " 20.....	23	17	5	" 13, '13	25 56.0	N. C. Stewart.
27'00 N.-SE cor. sec. 28.....	23	17	5	" 16, '13	55.5	"
37'00 N.- " 34.....	23	17	5	" 20, '13	26 07.2	"
43'70 E.-SW " 2.....	24	17	5	" 22, '13	04.4	"
At SE " 2.....	24	17	5	" 23, '13	25 56.7	"
65'00 N.- " 2.....	24	17	5	" 25, '13	26 07.9	"
5'00 N.- " 12.....	24	17	5	" 27, '13	25 58.3	"
70'00 N.- " 12.....	24	17	5	" 28, '13	57.1	"
16'50 E.-NE " 31.....	104	17	5	" 4, '13	33 48.8	J. R. Akins.
50'00 E.- " 11.....	23	18	5	July 21, '13	26 15.8	N. C. Stewart.
20'00 N.-SE " 13.....	23	18	5	" 23, '13	25 57.3	"
46'00 N.- " 13.....	23	18	5	" 24, '13	56.9	"
15'00 E.-NE " 13.....	23	18	5	" 31, '13	56.7	"
60'00 E.- " 13.....	23	18	5	Aug. 1, '13	50.1	"
38'10 N.- " 25.....	90	18	5	Apr. 23, '13	31 41.7	J. A. Fletcher.
7'25 E.- " 31.....	92	18	5	May 1, '13	13.6	J. R. Akins.
10'00 W.- " 35.....	92	18	5	" 2, '13	12.6	"
42'10 E.- " 35.....	92	18	5	" 5, '13	30.2	"
68'33 E.- " 33.....	92	18	5	" 13, '13	30 40.0	"
80'25 W.- " 36.....	96	18	5	June 5, '13	31 15.2	"
75'50 W.- " 35.....	96	18	5	" 6, '13	32 27.0	"
32'00 N.- " 12.....	96	18	5	May 31, '13	31 24.7	J. A. Fletcher.



## RESULTS OF MAGNETIC OBSERVATIONS—Continued.

TABLE I.—DECLINATION OBSERVATIONS—Continued.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
26° 00' N.-NE. cor. sec. 36	96	18	5	June 4, '13	30 58' 1	J. A. Fletcher.
54° 47' N. " 1	97	18	5	" 5, '13	31 38' 2	"
2° 00' N. " 13	99	18	5	" 19, '13	32 37' 6	"
31° 36' N. " 36	99	18	5	" 24, '13	25° 0	"
4° 50' S.-NE cor. sec. 25	100	18	5	June 30, '13	32 40' 6	"
80° 00' W. " 36	100	18	5	July 4, '13	54' 5	J. R. Akins.
10° 83' W. " 34	100	18	5	" 5, '13	57° 0	"
43° 00' N. " 24	101	18	5	" 12, '13	33 02' 3	J. A. Fletcher.
8° 80' N. " 25	103	18	5	" 18, '13	34 41' 6	"
8° 00' S. " 1	104	18	5	" 18, '13	52° 6	"
46° 20' W. " 36	104	18	5	" 25, '13	33 40' 5	J. R. Akins.
21° 75' W. " 34	104	18	5	" 27, '13	22° 9	"
61° 00' S. " 25	107	18	5	Aug. 28, '13	34 50' 1	J. A. Fletcher.
50° 00' S. " 36	108	18	5	" 13, '13	33 44' 9	"
41° 00' S. " 25	108	18	5	" 15, '13	55° 7	"
42° 14' W. " 34	108	18	5	" 25, '13	32 59' 8	"
15° 00' E.-NW " 31	46	19	5	Dec. 18, '12	28 12' 6	A. L. McNaughton.
2° 12' E.-NE " 31	92	19	5	Apr. 28, '13	32 11' 2	J. R. Akins.
4° 00' W. " 36	96	19	5	June 10, '13	33° 9	"
14° 32' W. " 32	96	19	5	" 13, '13	24° 3	"
21° 25' W. " 33	100	19	5	July 8, '13	33 13' 6	"
79° 20' W. " 32	100	19	5	" 9, '13	32 49' 9	"
20° 82' W. " 36	100	19	5	" 10, '13	48° 3	"
63° 42' W. " 35	100	19	5	" 11, '13	30° 6	"
12° 99' W. " 35	104	19	5	Sept. 8, '13	33 54' 7	J. A. Fletcher.
73° 90' E. " 32	92	20	5	Apr. 24, '13	12° 8	J. R. Akins.
62° 83' W. " 35	96	20	5	June 17, '13	32 57' 7	"
38° 88' W. " 36	96	20	5	" 18, '13	39° 1	"
50° 13' W. " 33	96	20	5	" 19, '13	51° 2	"
3° 91' W. " 34	100	20	5	July 17, '13	18° 3	"
59° 50' W. " 32	106	20	5	" 19, '13	49° 5	"
46° 82' W. " 32	104	20	5	Sept. 17, '13	33 55' 8	J. A. Fletcher.
53° 83' N. " 10	84	21	5	Dec. 18, '13	31 28' 6	L. E. Fontaine.
60° 00' E. " 31	92	21	5	Apr. 17, '13	32 30' 6	J. R. Akins.
45° 65' E. " 36	92	21	5	" 21, '12	33 27' 1	"
50° 00' W. " 35	96	21	5	June 22, '13	32 18' 5	"
57° 35' W. " 31	104	21	5	Sept. 22, '13	34 04' 5	J. A. Fletcher.
10° 00' E.-NE " 19	47	22	5	" 5, '12	27 58' 3	A. L. McNaughton.
60° 00' N. " 20	47	22	5	" 7, '12	53° 6	"
15° 00' N. " 19	47	22	5	" 9, '12	53° 7	"
15° 00' N. " 29	47	22	5	" 7, '12	56° 1	"
50° 00' S. " 19	47	22	5	" 20, '12	58° 0	"
60° 00' S. " 18	47	22	5	" 27, '12	28 00' 5	"
5° 00' W. " 33	47	22	5	Nov. 8, '12	27 55' 6	"
32° 00' S. " 15	48	22	5	July 11, '12	28 01' 4	"
10° 00' S. " 11	48	22	5	" 17, '12	01° 0	"
0° 93' S. " 13	83	22	5	Dec. 11, '13	31 32' 3	L. E. Fontaine.
3° 00' S. " 13	89	22	5	Mar. 27, '13	57° 8	J. R. Akins.
35° 77' N. " 36	89	22	5	" 31, '13	57° 5	"
30° 00' S. " 12	90	22	5	Apr. 2, '13	45° 6	"
24° 40' N. " 25	90	22	5	" 5, '13	27° 6	"
73° 72' W. " 36	90	22	5	" 7, '13	40° 1	"
70° 80' N.-SE " 1	91	22	5	" 8, '13	55° 3	"
" " 1	91	22	5	" 9, '13	41° 6	"
56° 80' N.-NE " 25	91	22	5	" 14, '13	44° 9	"
23° 51' N. " 1	92	22	5	" 15, '13	50° 6	"
5° 00' E. " 24	47	23	5	Sept. 5, '12	28 04' 1	A. L. McNaughton.
60° 00' E. " 24	47	23	5	" 5, '12	27 55' 1	"
10° 00' N.-SE " 19	47	23	5	Oct. 2, '12	28 07' 8	"
13° 00' S.-NE " 8	47	23	5	" 23, '12	08° 1	"
6° 00' N.-SE " 6	47	23	5	" 28, '12	27 57' 1	"
35° 00' N. " 4	47	23	5	" 29, '12	28 02° 0	"
10° 00' S.-NE " 24	48	23	5	Aug. 20, '12	27 58' 3	"
28° 58' S. " 20	85	23	5	Nov. 21, '13	31 28' 8	L. E. Fontaine.



SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS—*Continued.*TABLE I.—DECLINATION OBSERVATIONS—*Continued.*

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
12 32 S.-NE. cor. sec. 81	86	23	5	Nov. 23, '13	27° 8	L. E. Fontaine.
37° 00 S.-" 25	46	24	5	" 2, '13	27 57.2	A. L. McNaughton.
15° 09 N.-" 24	86	24	5	" 26, '13	31 21.2	L. E. Fontaine.
21° 75 S.-" 20	87	24	5	Dec. 3, '13	42.6	"
26° 43 N.-" 23	86	25	5	Nov. 29, '13	23.8	"
7° 00 E.-" 22	50	27	5	July 17, '12	27 47.2	C. A. Grassie.
21° 40 N.-" 23	50	27	5	" 18, '12	50.8	"
7° 37 N.-NE cor. sec. 26	50	27	5	July 19, '12	27° 53.6	"
52° 00 N.-" 22	50	27	5	" 28, '12	53.0	"
15° 30 N.-" 27	50	27	5	" 31, '12	47.9	"
31° 50 N.-" 34	48	23	5	Aug. 2, '12	29.0	"
39° 80 N.-" 3	49	28	5	" 3, '12	27.9	"
30° 00 E.-" 33	47	1	6	Sept. 6, '12	30.3	"
39° 50 N.-" 6	47	1	6	" 20, '12	23.6	"
10° 00 N.-SE " 6	47	1	6	" 21, '12	26.2	"
31° 62 E.-NE " 23	48	1	6	Aug. 30, '12	24.4	"
45° 00 N.-" 3	48	1	6	Sept. 5, '12	30.7	"
2° 00 W.-" 24	49	1	6	Aug. 22, '12	37.0	"
70° 00 W.-" 17	23	22	6	Sept. 5, '13	25 49.3	N. C. Stewart.
19° 00 S.-" 18	23	2	6	" 6, '13	43.1	"
62° 00 S.-" 18	23	2	6	" 8, '13	27.3	"
5° 00 S.-" 7	23	2	6	" 10, '13	30.5	"
35° 00 S.-" 7	23	2	6	" 10, '13	39.7	"
26° 00 E.-" 6	23	2	6	" 15, '13	53.5	"
44° 00 E.-" 6	23	2	6	" 16, '13	29.6	"
79° 00 E.-" 7	23	2	6	" 19, '13	00.2	"
26° 00 W.-" 15	23	3	6	" 30, '13	26 08.2	"
16° 00 W. centre sec. 23	23	3	6	Oct. 4, '13	12.0	"
At NE cor. sec. 7	23	3	6	" 9, '13	01.0	"
47° 00 S.-" 7	23	3	6	" 14, '13	25 31.3	"
23° 00 W.-" 6	23	3	6	" 15, '13	44.2	"
At " 6	45	3	6	" 9, '12	27 30.9	C. A. Grassie.
64° 07 N.-" 9	45	3	6	" 12, '12	26.3	"
3° 85 E.-" 9	45	3	6	" 14, '12	29.7	"
42° 10 E.-" 7	45	3	6	" 22, '12	31.8	"
At " 7	45	3	6	" 23, '12	39.1	"
47° 00 W.-" 1	23	4	6	" 18, '13	26 00.4	N. C. Stewart.
16° 00 W.-" 2	23	4	6	" 20, '13	25 23.0	"
4° 00 W.-" 3	23	4	6	" 23, '13	53.8	"
53° 00 S.-" 17	23	4	6	" 25, '13	41.4	"
43° 00 N.-" 17	23	4	6	" 29, '13	25 43.3	"
9° 00 W.-" 17	23	4	6	" 28, '13	46.3	"
73° 00 W.-" 17	23	4	6	" 29, '13	43.2	"
40° 00 W.-" 20	23	4	6	" 30, '13	37.0	"
43° 00 W.-" 18	23	4	6	" 30, '13	39.9	"
32° 00 W.-" 19	23	4	6	" 31, '13	34.6	"
18° 27 N.-" 19	70	4	6	" 7, '13	28 24.8	L. E. Fontaine.
30° 00 S.-" 24	23	5	6	" 31, '13	25 31.6	N. C. Stewart.
63° 00 W.-" 24	23	5	6	Nov. 3, '13	40.5	"
53° 00 S.-" 23	23	5	6	" 8, '13	39.3	"
3° 00 W.-" 29	23	5	6	" 11, '13	55.1	"
50° 00 W.-" 29	23	5	6	" 12, '13	26 04.0	"
11° 00 W.-" 30	23	5	6	" 13, '13	00.0	"
34° 60 S.-" 15	70	5	6	Oct. 2, '13	28 54.4	L. E. Fontaine.
24° 63 N.-" 11	85	5	8	Nov. 1, '13	29 45.5	"
20° 00 W.-" 23	23	6	6	" 17, '13	25 47.9	N. C. Stewart.
5° 00 N.-" 24	70	6	6	Sept. 29, '13	29 12.1	L. E. Fontaine.
67° 35 E.-SE " 4	79	6	6	Aug. 28, '13	30 25.4	"
25° 70 S.-NE " 36	85	6	6	Nov. 5, '13	12.7	"
0° 33 N.-" 36	79	7	6	July 29, '13	32 15.8	"
16° 90 S.-" 36	80	7	6	" 18, '13	31 13.8	"
15° 68 N.-" 36	85	7	6	Nov. 6, '13	30 47.9	"
57° 49 S.-" 10	87	7	6	" 12, '13	38.0	"
77° 00 N.-SE " 12	18	8	6	" 26, '13	25 36.8	N. C. Stewart.



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RESULTS OF MAGNETIC OBSERVATIONS—*Continued.*TABLE I.—DECLINATION OBSERVATIONS—*Continued.*

Place.	Township. Range.	Meridian.	Date.	Declination.	Observer.
36.56 N.-NE. cor. sec. 21.	86 8	6	Nov. 9, '13	31 18.0	L. E. Fontaine.
23.00 W.- " 25	19 9	6	May 16, '13	26 29.2	N. C. Stewart.
60.00 N.- " 35	19 9	6	" 19, '13	20.3	"
75.00 N.- " 4	20 9	6	" 14, '13	25 53.6	"
At " 11	20 9	6	" 21, '13	39.2	"
2.00 N.- " 2	20 9	6	" 25, '13	57.9	"
40.00 E.- " 2	20 9	6	" 26, '13	26 36.1	"
16.00 E.- " 7	21 10	6	Dec. 8, '13	25 44.0	"
26.50 E.- " 7	21 10	6	" 9, '13	48.0	"
0.59 S.-NE. cor. sec. 32	69 10	6	Oct. 17, '13	28 02.1	L. E. Fontaine.
68.00 S.- " 12	18 11	6	Dec. 1, '13	25 48.6	N. C. Stewart.
20.00 S.- " 7	21 11	6	" 13, '13	25 27.5	"
13.00 W.- " 6	21 11	6	" 16, '13	44.5	"
42.00 W.- " 6	21 12	6	" 17, '13	34.4	"
7.00 E.- " 12	21 12	6	" 11, '13	47.9	"
26.00 E.- " 12	21 12	6	" 12, '13	37.8	"
29.00 W.- " 23	24 12	6	July 3, '13	26 42.0	"
29.00 S.- " 29	25 12	6	June 4, '13	39.1	"
45.00 S., 23.00 W.-NE. cor. sec. 28	25 12	6	" 13, '13	50.6	"
At Sta. 67, Trav. Adams lake in sec. 16.	25 12	6	" 17, '13	27 02.9	"
71.00 N.-NE. cor. sec. 9	25 12	6	" 24, '13	02.6	"
36.00 W.- " 9	25 12	6	" 25, '13	26 47.7	"
45.00 E.-SE. " 34	16 13	6	" 3, '13	25 39.8	C. H. Taggart.
20.00 S.-NE. " 30	16 13	6	" 10, '13	26 01.6	"
30.00 W.- " 31	16 13	6	" 7, '13	27 48.0	"
30.00 S.- " 26	24 13	6	July 3, '13	26 54.7	N. C. Stewart.
29.00 N.- " 26	24 13	6	" 5, '13	27 19.3	"
At " 1	25 14	6	" 11, '13	26 33.8	"
60.00 E.- " 9	19 15	6	Apr. 30, '13	24 57.8	C. H. Taggart.
At " 4	19 15	6	May 3, '13	27 00.1	"
5.00 S.- " 4	19 15	6	" 5, '13	28 22.1	"
30.00 N.- " 1	19 15	6	" 24, '13	24 10.6	"
20.00 S.- " 18	21 18	6	June 27, '13	48.6	"
10.00 S.-NW. " 6	21 19	6	July 21, '13	26 17.7	"
40.00 W.-NE. " 1	21 20	6	" 16, '13	27 35.7	"
43.00 E.-NW. " 21	17 24	6	May 22, '13	46.4	J. A. Calder.
6.00 N.- $\frac{1}{4}$ sec. cor. N. by sec. 1.	17 24	6	June 5, '13	28 47.4	"
At Sta. 9, Course 8-9, 15.00 W., 18.00 S., NE. cor. sec. 18, Thompson River	18 24	6	Dec. 7, '13	27 30.1	C. H. Taggart.
" " " "	18 24	6	" 7, '13	32.1	"
" " " "	18 24	6	" 7, '13	30.7	"
" " " "	18 24	6	" 7, '13	27 31.6	"
" " " "	18 24	6	" 7, '13	34.7	"
" " " "	18 24	6	" 7, '13	29.3	"
" " " "	18 24	6	" 7, '13	30.3	"
" " " "	18 24	6	" 7, '13	29.3	"
35.00 W.-NE. cor. sec. 19	18 24	6	" 7, '13	26 40.6	"
At " 7	3 25	6	July 22, '12	24 54.6	A. Lighthall.
T.B. 495-2.					
39.00 W.-NE. cor. sec. 6	8 25	6	June 20, '13	25 52.1	A. E. Hunter.
6.00 W.- " 6	8 25	6	" 24, '13	46.9	"
16.30 S.- $\frac{1}{4}$ sec. cor. E. by sec. 26	15 25	6	Aug. 23, '13	29 27.5	J. A. Calder.
16.30 S.- " 26	15 25	6	" 23, '13	30.3	"
61.00 S.-NE. cor. sec. 21	15 25	6	" 15, '13	32 12.4	"
16.30 S.- $\frac{1}{4}$ sec. cor. E. by sec. 26	15 25	6	" 24, '13	29 27.1	"
" 26	15 25	6	" 25, '13	28.0	"
" 26	15 25	6	" 26, '13	30.7	"
" 26	15 25	6	" 27, '13	29.6	"
15.00 W.-NE. cor. sec. 17	15 25	6	" 13, '13	42.3	"
6.30 E.- " 8	16 25	6	June 16, '13	27 43.7	"
8.30 E.-NW. cor. Nicomen I.R. No. 10	16 25	6	" 14, '13	17.3	"
7.00 S.- " 10	16 25	6	" 17, '13	34.9	"
40.00 S.-NE. cor. sec. 27	17 25	6	May 15, '13	25 40.9	"
At " 16	19 25	6	Nov. 18, '13	24 17.0	"



## SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS—*Continued.*TABLE I.—DECLINATION OBSERVATIONS—*Continued.*

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
20°00 E.-NE. cor. sec. 33	20	25	6	Sept. 9, '13.	25 57.6	C. H. Taggart.
At " 7	20	25	6	Oct. 31, '13.	54.8	"
40°00 W.- $\frac{1}{4}$ sec. cor. E. by sec. 35.	21	25	6	Aug. 15, '13.	27 13.7	"
40°00 S.-NE. cor. sec. 22	21	25	6	" 19, '13.	26 56.0	"
40°00 E.- " 10	21	25	6	" 21, '13.	44.2	"
40°00 S.- " 10	21	25	6	" 22, '13.	25 55.8	"
20°00 W.- $\frac{1}{4}$ sec. cor. E. by sec. 33.	21	25	6	Sept. 3, '13.	26 55.8	"
At NE cor. sec. 22	21	25	6	Sept. 4, '13	27 45.0	C. H. Taggart.
20°00 S.- " 17	21	25	6	" 17, '13	26 36.4	"
40°00 E.- " 31	21	25	6	" 22, '13	21.5	"
20°00 E.- " 31	21	25	6	" 22, '13	07.5	"
15°00 N.-NW " 6	21	25	6	" 30, '13	38.2	"
40°41 W.-NE " 2	5	26	6	June 4, '13	25 13.5	W. J. Johnston.
At " 3	5	26	6	" 5, '13	24 55.4	"
20°00 E.- " 3	5	26	6	" 7, '13	25 18.4	"
At SE cor. Lot. 2	5	26	6	" 10, '13	26.4	"
40°00 S.-NE cor. sec. 22	5	26	6	" 13, '13	37.5	"
67°00 S.- " 22	5	26	6	" 16, '13	31.2	"
45°00 N.- " 22	55	26	6	" 18, '13	41.4	"
22°00 S.- " 27	5	26	6	" 19, '13	50.9	"
45°00 W.- " 27	5	26	6	" 20, '13	45.7	"
53°00 W.- " 27	5	26	6	" 21, '13	31.6	"
49°40 N.- " 27	5	26	6	" 23, '13	24.8	"
35°49 W.- " 34	5	26	6	July 7, '13	26 13.4	"
10°00 W.-NE cor. Lot 873 sec. 34.	5	26	3	" 11, '13	24 54.7	"
At NE cor. sec. 28	5	26	6	Aug. 11, '13	25 38.5	"
At NW cor. of Yale I. R. 8.	6	26	6	" 9, '13	23.9	"
At NE cor. sec. 21	6	26	6	" 13, '13	34.7	"
20°50 N.- " 21	6	26	6	" 15, '13	26 14.1	"
35°00 E.-NW cor SW $\frac{1}{4}$ sec. 27.	6	26	6	" 16, '13	25 46.9	"
25°00 W.-NE cor. sec. 16	6	26	6	" 19, '13	26 14.0	"
70°00 S.- " 3	6	26	6	June 24, '13	25 47.6	"
26°10 S.- " 3	6	26	6	" 25, '13	51.5	"
18°00 N.- " 3	6	26	6	" 30, '13	44.4	"
40°00 N.- " 3	6	26	6	July 2, '13	35.2	"
At " 10	6	26	6	" 3, '13	27.6	"
40°25 N.- " 10	6	26	6	" 4, '13	36.6	"
40°00 N.- " 15	6	26	6	" 15, '13	14.9	"
35°00 S.- " 27	6	26	6	" 17, '13	48.9	"
40°00 N.- " 27	6	26	6	July 19, '13	25 15.8	"
40°40 E.- " 3	6	26	6	" 24, '13	14.2	"
20°00 W.- " 3	6	26	6	" 28, '13	17.0	"
8°60 W.- " 3	6	26	6	" 29, '13	11.1	"
At SE cor. of Yale I. R. No. 11, sec. 3.	6	26	6	" 31, '13	24.6	"
At NE cor. sec. 9	6	26	6	Aug. 2, '13	30.2	"
At " 4	6	26	6	" 4, '13	25.2	"
40°00 S.-NW cor. of Yale I. R. No. 11.	6	26	6	" 6, '13	38.2	"
At SE cor. sec. 3	7	26	6	" 22, '13	26 04.9	"
22°00 N.-NE cor. NW $\frac{1}{4}$ sec. 3.	7	26	6	" 26, '13	13.0	"
30°00 S.-NW cor. Lot 48	7	26	6	" 27, '13	23.4	"
5°00 E.-SW " 48	7	26	6	" 28, '13	28.8	"
25°00 W.-NE cor. sec. 14	7	26	6	" 30, '13	38.3	"
65°00 S.- " 35	7	26	6	Sept. 5, '13	30.2	"
36°10 S.- " 26	7	26	6	" 6, '13	31.0	"
40°25 S.-NE cor. NW $\frac{1}{4}$ sec. 24.	7	26	6	" 10, '13	31.4	"
40°61 W.-NE cor. sec. 13	7	26	6	" 11, '13	41.5	"
14°00 W.- " 13	7	26	6	" 15, '13	25.9	"
38°00 W.- " 36	7	26	6	" 17, '13	35.0	"
20°12 S.- " 2	7	26	6	" 20, '13	32.1	"
10°00 N.- " 11	7	26	6	" 23, '13	34.0	"
63°00 E.-SW cor. of Yale I. R. No. 3.	7	26	6	" 27, '13	40.5	"
At NE cor. NW $\frac{1}{4}$ sec. 14	7	26	6	Oct. 2, '13	44.4	"
39°00 N.-NE cor. sec. 1	8	26	6	June 10, '13	25 32.1	A. E. Hunter.
45°00 E.- " 11	8	26	6	" 14, '13	33.9	"



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RESULTS OF MAGNETIC OBSERVATIONS—*Continued.*TABLE I.—DECLINATION OBSERVATIONS—*Continued.*

Place.	Township.	Range.	Meridan.	Date.	Declination.	Observer.
50° 00' S.-NE. cor. sec. 1	8	26	6	June 15, '13	24 51.2	A. E. Hunter.
20° 00' W. " 13	8	26	6	" 17, '13	25 59.0	"
48° 00' E. " 26	8	26	6	July 1, '13	31.1	"
54° 30' N. " 25	8	26	6	" 4, '13	26 15.7	"
67° 20' N. " 35	8	26	6	" 10, '13	21.5	"
20° 00' W. " 35	8	26	6	Aug. 9, '13	18.1	"
65° 00' W.-NE cor. sec. 35	8	26	6	Aug. 11, '13	26 13.9	"
23° 56' N. " 2	9	26	6	July 11, '13	21.9	"
56° 00' N. " 2	9	26	6	" 12, '13	10.4	"
75° 00' N. " 2	9	26	6	" 14, '13	16.3	"
10° 00' N. " 14	9	26	6	" 17, '13	35.3	"
50° 00' N. " 14	9	26	6	" 18, '13	49.7	"
20° 00' N. " 3	9	26	6	Aug. 15, '13	02.6	"
40° 00' N. " 3	9	26	6	" 16, '13	00.0	"
63° 00' N. " 3	9	26	6	" 19, '13	09.9	"
33° 00' N. " 10	9	26	6	" 20, '13	07.9	"
41° 00' N. " 15	9	26	6	" 23, '13	12.3	"
15° 00' N. " 21	9	26	6	Sept. 11, '13	07.0	"
36° 00' N. " 21	9	26	6	" 12, '13	04.0	"
At " 28	9	26	6	" 15, '13	07.8	"
17° 20' E. " 28	9	26	6	" 16, '13	05.4	"
77° 00' N. " 22	9	26	6	" 25, '13	14.1	"
48° 00' N. " 22	9	26	6	" 26, '13	14.6	"
31° 00' N. " 27	9	26	6	" 27, '13	20.0	"
63° 00' N. " 27	9	26	6	" 29, '13	25.2	"
10° 00' N. " 34	9	26	6	" 30, '13	23.8	"
3° 50' W. " 34	9	26	6	Oct. 1, '13	31.4	"
68° 00' N. " 34	9	26	6	" 2, '13	23.6	"
30° 00' N. " 33	9	26	6	" 11, '13	07.8	"
20° 00' N. " 3	10	26	6	" 3, '13	23.6	"
46° 00' N. " 3	10	26	6	" 4, '13	25.0	"
35° 00' W. " 3	10	26	6	" 7, '13	21.2	"
34° 00' N. " 4	10	26	6	" 15, '13	04.6	"
27° 00' E. " 9	10	26	6	" 17, '13	14.2	"
70° 00' E. " 9	10	26	6	" 18, '13	21.9	"
43° 00' N. " 10	10	26	6	" 20, '13	18.2	"
36° 00' W. " 4	10	26	6	" 30, '13	25 54.4	"
40° 00' E. " 10	10	26	6	Nov. 1, '13	21.0	"
10° 00' S. " 7	12	26	6	Oct. 25, '13	46.2	A. V. Chase.
35° 00' E.-NW " 31	12	26	6	Nov. 8, '13	55.8	"
30° 00' S.-NE " 19	12	26	6	" 13, '13	26 20.6	"
At Sta. 9 traverse Left bank of Fraser R	12	26	6	" 18, '13	25 20.6	"
13° 00' N.-SE cor. sec. 5	12	26	6	" 20, '13	25 55.0	"
14° 50' W.-Wit. P.N. By. Boothroyd	13	26	6	Aug. 13, '13	25 40.7	"
I.R. No. 8	15	26	6	Dec. 12, '13	27 13.0	J. A. Calder.
44° 00' N.-SE cor. sec. 6	19	26	6	Nov. 6, '13	25 45.4	C. H. Taggart.
At NE " 31	20	26	6	Oct. 28, '13	26 11.5	"
20° 00' S. " 17	20	26	6	Nov. 1, '13	08.6	"
At " 19	20	26	6	" 8, '13	09.4	"
5° 00' S. " 8	21	26	6	Oct. 16, '13	18.7	"
50° 00' S. " 7	4	27	6	" 17, '13	24 43.5	W. J. Johnston.
13° 00' S. " 29	4	27	6	" 20, '13	38.7	"
14° 00' W. " 20	4	27	6	" 21, '13	47.2	"
67° 00' S. " 19	5	27	6	June 28, '13	25 07.3	"
37° 00' S. " 2	12	27	6	Sept. 5, '13	23 40.8	A. V. Chase.
30° 00' E. " 15	12	27	6	" 9, '13	25 32.2	"
At Sta. 60, traverse of N. river	12	27	6	" 10, '13	41.2	"
4° 00' W.-NE cor. sec. 15	12	27	6	" 12, '13	33.2	"
60° 00' W. " 15	13	27	6	" 22, '13	36.8	"
At Sta. S. 10 traverse S. side of Lake Francis	13	27	6	July 4, '13	26 15.4	"
44° 00' W.-NE cor. sec. 36	13	27	6	" 14, '13	25 40.1	"
40° 25' S. " 13	13	27	6	" 21, '13	26 19.5	"
32° 00' N. " 26	13	27	6			"



SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS—*Continued.*TABLE I.—DECLINATION OBSERVATIONS—*Concluded.*

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
15° 00 N.-SE " 1.....	13	27	6	Aug. 16, '13	25 37.7	A. V. Chase.
At NE " 1.....	13	27	6	" 20, '13	19.4	"
At $\frac{1}{4}$ cor. N. by. sec. 1.....	13	27	6	Nov. 3, '13	36.5	"
15° 00 N.- $\frac{1}{4}$ cor. N. by. sec. 12.....	13	27	6	" 5, '13	22.8	"
At Centre sec. 25.....	14	27	6	May 30, '13	50.7	"
At " 12.....	14	27	6	June 10, '13	26 13.7	"
50° 00 N.-NE cor. sec. 27.....	14	27	6	" 19, '13	21.0	"
At " 22.....	14	27	6	" 21, '13	02.9	"
60° 00 N.- " 22.....	14	27	6	" 17, '13	25 02.8	"
56° 00 E.- " 15.....	14	27	6	Dec. 1, '13	26 27.0	"
At $\frac{1}{4}$ cor. N. By. sec. 35.....	14	27	6	" 3, '13	24.5	"
40° 00 W.-NE cor. Lytton I.R. No. 3...	16	27	6	Oct. 1, '13	27 09.3	J. A. Calder.
40° 00 W.- " ".....	16	27	6	" 1, '13	09.4	"
40° 00 W.- " ".....	16	27	6	" 1, '13	12.0	"
40° 00 E.- " ".....	16	27	6	" 1, '13	13.6	"
40° 00 W.- " ".....	16	27	6	" 1, '13	18.4	"
40° 00 W.- " ".....	16	27	6	" 1, '13	13.3	"
40° 00 E.- " ".....	16	27	6	" 1, '13	09.0	"
40° 00 W.- " ".....	16	27	6	" 1, '13	06.8	"
40° 00 W.- " ".....	16	27	6	" 1, '13	07.1	"
42° 00 S.- cor. sec. 6.....	17	27	6	" 17, '13	26 35.9	"
4° 00 E.-NW " 7.....	17	27	6	" 29, '13	06.0	"
1° 00 S.-NE " 5.....	18	27	6	Nov. 14, '13	35.0	"
4° 00 W.- " 26.....	20	27	6	Oct. 20, '13	25 07.7	C. H. Taggart.
53° 00 S.- " 27.....	20	27	6	" 21, '13	26 33.3	"
10° 00 N.- " 15.....	20	27	6	" 22, '13	23 31.2	"
20° 00 W.-SE " 32.....	1	28	6	Sept. 30, '13	25 17.0	R. B. McKay.
10° 00 W.-NE " 2.....	4	28	6	Oct. 22, '13	24 57.2	W. J. Johnston.
20° 00 S.- " 11.....	4	28	6	" 25, '13	50.8	"
44° 45 W.- " 12.....	4	28	6	" 29, '13	57.2	"
10° 00 W.- " 13.....	12	28	6	Sept. 25, '13	25 33.8	A. V. Chase.
20° 00 E.- " 14.....	12	28	6	" 26, '13	38.0	"
At $\frac{1}{4}$ sec. cor. N. by. sec. 14.....	12	28	6	" 27, '13	35.1	"
At Sta. 103, N. of Nahatlatch lake.....	12	28	6	Oct. 19, '13	16.8	"
19° 00 E.-Centre of sec. 9.....	12	28	6	" 20, '13	19.4	"
20° 00 W.- " 10.....	12	28	6	" 20, '13	44.7	"
10° 00 N.- " 10.....	12	28	6	" 21, '13	48.3	"
24° 70 N.- $\frac{1}{4}$ sec. cor. N. by. sec. 12.....	17	28	6	Nov. 3, '13	25 46.6	J. A. Calder.
40° 40 E.-NE cor. sec. 11.....	18	28	6	Dec. 8, '13	27 49.5	"
31° 00 E.- " 14.....	18	28	6	" 8, '13	28 50.3	"
20° 00 S.- $\frac{1}{4}$ sec. cor. E. by. sec. 33.....	1	29	6	Sept. 26, '13	24 31.6	R. B. McKay.
At NE cor. Lot 20, Gr. 2.....	12	.....	E.C.M.	Oct. 28, '12	25 55.4	A. Lighthall.
At NW cor. Langley Townsite.....	12	.....	"	" 30, '12	26.4	"
At $\frac{1}{4}$ cor. S. by. sec. 1.....	19	.....	"	Aug. 22, '13	23 24.5	R. B. McKay.
5° 00 E.- $\frac{1}{4}$ cor. W. by. sec. 12.....	19	.....	"	Oct. 16, '13	25 45.5	"
7° 00 E.-NW cor. sec. 19.....	21	.....	"	June 17, '13	32.1	"
1° 00 N.- $\frac{1}{4}$ cor S. by. sec. 7.....	22	.....	"	Aug. 22, '13	23 18.1	"
7° 00 S.- $\frac{1}{4}$ cor E. by. sec. 35.....	22	.....	"	Sept. 19, '13	43.6	"
At $\frac{1}{4}$ cor. S. by. sec. 29.....	22	.....	"	Oct. 5, '13	43.5	"
52° 00 S.-NE cor. sec. 27.....	23	.....	"	" 29, '13	35.2	"
11° 00 W.- " T.B. 86, in sec. 14.....	39	.....	W.C.M.	July 3, '13	24 48.6	"
At NE cor. sec. 11.....	39	.....	"	" 8, '13	36.5	"
6° 00 S.- $\frac{1}{4}$ cor. E. by. sec. 11.....	39	.....	"	" 5, '13	49.1	"
60° 00 S.-NE cor. sec. 20.....	39	.....	"	" 28, '13	34.9	"



RESULTS OF MAGNETIC OBSERVATIONS—Continued.  
TABLE II.—INCLINATION AND TOTAL INTENSITY.

STATION.	Tp.	Rge.	Mer.	Date.	INCLINATION.		TOTAL INTENSITY.		Observer.	Instrument.
					L. M. T.	Value.	L. MT.	Value. c.g.s.		
37°00 W., 25°00 N.—NE cor. 1 sec. 23.	29	19	Pr.	Nov. 17, '11	h	79 12.16	h	0° 63537	R. C. Purser....	T. S. 62.
" " " " " " " "	29	19	Pr.	" 17, '11	14° 1'—15° 1'	12 8	15° 1'—15° 4'	0° 63543	" " " "	" " " "
" " " " " " " "	29	19	Pr.	" 17, '11	14° 8'—15° 8'	12 8	15° 1'—15° 4'	0° 63540	" " " "	" " " "
30°00 NE.—NE. cor. sec. 5	18	20	Pr.	June 16, '11	15° 4'—16° 3'	12 8	15° 8'—16° 1'	0° 63534	G. A. Bennett....	T. S. 61.
30°00 NE.—" " " " " " " "	18	20	Pr.	" 16, '11	9° 8'—11° 7'	78 01.4	10° 4'—11° 0'	0° 63138	" " " "	" " " "
" " " " " " " "	18	20	Pr.	" 16, '13	11° 1'—13° 3'	00.6	11° 7'—12° 3'	0° 63176	Blair Gray.....	" " " "
" " " " " " " "	18	20	Pr.	" 16, '13	12° 7'—14° 4'	00.6	13° 3'—13° 9'	0° 63213	" " " "	" " " "
" " " " " " " "	18	20	Pr.	" 16, '13	13° 9'—15° 6'	77 59.9	14° 4'—15° 0'	0° 63825	" " " "	" " " "
12°00 S.—NE cor. sec. 8.	18	21	Pr.	" 17, '13	15° 6'—17° 2'	78 09.1	16° 2'—16° 7'	0° 63753	G. A. Bennett....	" " " "
" " " " " " " "	18	21	Pr.	" 17, '13	16° 8'—18° 8'	07.8	17° 6'—18° 2'	0° 63682	Blair Gray.....	" " " "
30°00 S.—" " " " " " " "	18	21	Pr.	" 23, '13	8° 4'—10° 5'	08.0	9° 3'—9° 9'	0° 63779	" " " "	" " " "
" " " " " " " "	18	21	Pr.	" 23, '13	10° 0'—11° 9'	08.0	10° 6'—11° 1'	0° 63734	G. A. Bennett....	" " " "
" " " " " " " "	18	21	Pr.	" 23, '13	11° 3'—13° 5'	07.8	12° 1'—12° 7'	0° 63687	E. J. Wight....	T. S. 62.
15°00 E.—" " " " " " " "	33	31	Pr.	" 20, '13	15° 4'—16° 6'	32.7	15° 9'—16° 3'	0° 63765	" " " "	" " " "
" " " " " " " "	33	31	Pr.	" 20, '13	16° 3'—17° 4'	33.4	16° 6'—16° 9'	0° 63065	Blair Gray.....	T. S. 61.
20°00 S.—" " " " " " " "	19	1	2	" 7, '13	14° 1'—16° 0'	77 41.7	14° 7'—15° 4'	0° 63154	G. A. Bennett....	" " " "
" " " " " " " "	19	1	2	" 7, '13	15° 6'—17° 9'	44.3	16° 2'—17° 0'	0° 63048	" " " "	" " " "
" " " " " " " "	19	1	2	" 7, '13	17° 1'—19° 4'	46.0	18° 0'—18° 9'	0° 63026	Blair Gray.....	" " " "
" " " " " " " "	19	1	2	" 7, '13	19° 0'—20° 7'	43.2	19° 5'—20° 1'	0° 63140	" " " "	" " " "
15°00 S.—" " " " " " " "	19	1	2	" 9, '13	8° 5'—10° 2'	41.0	9° 1'—9° 6'	0° 62741	G. A. Bennett....	" " " "
2°00 NE.— $\frac{1}{4}$ M.N. by sec. 23	19	8	2	Nov. 14, '13	9° 9'—10° 9'	31.9	8° 3'—8° 9'	0° 62581	Blair Gray.....	" " " "
12°00 N.— $\frac{1}{4}$ " " " " " "	7	10	2	July 14, '13	7° 3'—9° 6'	76 34.9	9° 8'—10° 5'	0° 62833	G. A. Bennett....	" " " "
12°00 N.— $\frac{1}{4}$ " " " " " "	7	10	2	" 14, '13	9° 1'—11° 2'	77 52.2	9° 5'—9° 8'	0° 62833	E. J. Wight....	T. S. 62.
9°00 SE.— $\frac{1}{4}$ P.E. by sec. 21	26	11	2	June 16, '11	8° 8'—10° 3'	77 52.2	9° 5'—9° 8'	0° 62755	" " " "	" " " "
" " " " " " " "	26	11	2	" 16, '11	9° 8'—11° 1'	51.6	10° 3'—10° 8'	0° 62832	" " " "	" " " "
10°00 S., 25°00 W.—NE cor. sec. 27	33	11	2	Dec. 13, '11	13° 8'—14° 6'	78 14.9	14° 0'—14° 3'	0° 62828	" " " "	" " " "
" " " " " " " "	33	11	2	" 13, '13	14° 3'—15° 2'	15.1	15° 1'—15° 5'	0° 62825	" " " "	" " " "
" " " " " " " "	33	11	2	" 13, '13	14° 9'—15° 8'	15.1	15° 2'—15° 5'	0° 62961	Blair Gray.....	T. S. 61.
20°00 W.—NE cor. sec. 13.	18	13	2	July 25, '13	14° 1'—16° 1'	77 04.0	14° 9'—15° 5'	0° 62938	" " " "	" " " "
" " " " " " " "	18	13	2	" 25, '13	15° 6'—17° 2'	04.8	16° 1'—16° 6'	0° 62807	E. J. Wight....	T. S. 62.
8°00 S., 30°00 W.—NE cor. sec. 12	33	13	2	Aug. 26, '13	13° 2'—14° 2'	78 11.8	13° 6'—13° 9'	0° 62810	" " " "	" " " "
" " " " " " " "	33	13	2	" 26, '13	13° 9'—14° 7'	11.6	14° 2'—14° 5'	0° 62816	" " " "	" " " "
36°00 S., 30°00 E.—NW cor. sec. 12	33	13	2	" 26, '13	14° 5'—15° 3'	11.6	14° 7'—15° 1'	0° 63177	" " " "	" " " "
" " " " " " " "	33	13	2	" 26, '13	10° 3'—11° 2'	79 00.0	10° 7'—11° 0'	0° 63180	" " " "	" " " "
1°00 SE.— $\frac{1}{4}$ I.P. centre sec. 31	47	14	2	July 27, '13	11° 0'—11° 8'	00.6	11° 2'—11° 6'	0° 62891	" " " "	" " " "
" " " " " " " "	42	16	2	" 7, '13	14° 3'—16° 2'	78 35.9	15° 1'—15° 7'	0° 62809	" " " "	" " " "
8°00 N., 8°00 W.—SE cor. sec. 15.	25	27	2	July 5, '13	7° 4'—8° 4'	77 04.7	7° 8'—8° 1'	0° 62809	" " " "	" " " "



## SESSIONAL PAPER No. 25b

48°00' N., 8°00' W.—SE cor. sec. 15.	25	27	2	2	July	5, '13	8°1—8°8	05°2	8°4—8°7	0°62816	E. J. Wight....	T. S. 62.
" " " " " " " " " " " "	25	27	2	2	"	5, '13	8°7—9°4	05°3	8°8—9°1	0°62839	"	"
25°00' W., 13°00' S.—NE cor. sec. 21.	33	28	2	2	Sept.	1, '13	8°3—9°3	77°34.1	8°8—9°1	0°62907	"	"
" " " " " " " " " " " "	33	28	2	2	"	1, '13	9°1—9°9	77°33.8	9°3—9°7	0°62910	"	"
25°00' W., 15°00' S.—NE cor. sec. 21.	33	28	2	2	Sept.	1, '13	9°7—10°5	77°33.5	9°9—10°3	0°62907	"	"
40°00' E. NE cor. sec. 21.	17	1	3	3	Sept.	23, '13	16°3—20°2	77°02.9	18°7—19°3	0°62638	G. A. Bennett..	T. S. 61.
30°00' E. NE " " " "	17	1	3	3	July	7, '13	15°3—17°4	76°58.3	16°2—16°7	0°62718	Blair Gray....	"
20°00' N. NE " " " "	15	2	3	3	June	30, '13	14°8—16°8	46°3	15°7—16°3	0°62745	"	"
20°00' N. NE " " " "	15	2	3	3	"	30, '13	16°4—18°3	44°7	17°0—17°7	0°62391	"	"
30°00' N. NE " " " "	15	2	3	3	July	1, '13	8°3—10°2	46°3	9°0—9°5	0°62666	"	"
30°00' N. NE " " " "	15	2	3	3	"	1, '13	9°7—11°4	45°9	10°3—10°8	0°62710	"	"
At NE " " " "	30	3	3	3	June	2, '13	10°9—12°4	77°14.1	11°3—11°9	0°62909	E. J. Wight....	T. S. 62.
At NE " " " "	30	3	3	3	"	2, '13	12°0—13°8	13°5	12°9—13°4	0°62885	"	"
15°00' E. 20°00' S.—NW cor. sec. 9.	37	5	3	3	Aug.	14, '13	14°9—15°9	37°2	15°3—15°7	0°62864	"	"
15°00' E. 20°00' S.—NW cor. sec. 9.	37	5	3	3	"	14, '13	15°6—16°5	37°1	15°9—16°2	0°62893	"	"
43°00' E. NE cor. sec. 14.	25	6	3	3	"	14, '13	16°2—17°1	37°0	16°5—16°8	0°62897	"	"
43°00' E. NE " " " "	25	6	3	3	Nov.	21, '13	13°6—14°5	76°55°6	14°3—14°9	0°62488	Blair Gray....	T. S. 61.
20°00' W.—NE " " " "	42	6	3	3	"	22, '13	13°1—15°7	57°5	13°8—14°6	0°62490	G. A. Bennett..	"
12°00' E. 1 sec. cor. N. by sec. 9.	53	7	3	3	June	27, '13	13°7—14°7	78°07.8	14°1—14°5	0°62484	E. J. Wight....	T. S. 62.
5°00' N. 3°00' W.—SE " " " "	53	7	3	3	"	27, '13	9°7—11°7	16°5	10°4—10°9	0°62638	R. C. Purser...	"
5°00' N. 3°00' W.—SE " " " "	53	7	3	3	Nov.	4, '13	3°5—10°5	59°4	9°9—10°3	0°63119	E. J. Wight....	"
15°00' W.—NE " " " "	15	14	3	3	"	4, '13	10°3—11°1	59°1	10°5—10°9	0°63123	"	"
15°00' W.—NE " " " "	15	14	3	3	Oct.	16, '13	10°9—11°8	59°0	11°1—11°4	0°63125	"	"
6°50' N. 4°50' E.—NE " " " "	30	15	3	3	May	20, '13	8°8—11°8	14°9	15°2—15°7	0°62146	Blair Gray....	T. S. 61.
6°50' N. 4°50' E.—NE " " " "	30	15	3	3	"	28, '13	9°8—10°9	77°01.3	10°7—11°3	0°62147	"	"
15°00' W.—NE cor. sec. 25.	17	16	3	3	"	28, '13	10°2—12°1	77°01.3	9°6—10°2	0°62559	E. J. Wight....	T. S. 62.
10°00' W.—NE " " " "	19	18	3	3	Oct.	17, '13	11°4—12°9	76°24.4	10°9—11°6	0°62568	"	"
2°00' S.—NE " " " "	39	19	3	3	May	22, '13	8°8—11°3	32°2	12°0—12°4	0°62154	Blair Gray....	T. S. 61.
18°00' E. 1 P.W. by sec. 16.	45	23	3	3	July	19, '13	15°0—15°9	77°34.2	9°7—10°6	0°62667	"	"
18°00' E. 1 P.W. by sec. 16.	45	23	3	3	"	19, '13	15°7—16°6	77°33.5	15°3—15°7	0°62435	E. J. Wight....	T. S. 62.
55°00' S.—NE cor. sec. 17.	50	23	3	3	"	9, '13	14°5—15°5	49°8	15°9—16°3	0°62438	"	"
55°00' S.—NE " " " "	50	23	3	3	"	9, '13	15°1—16°1	50°1	14°8—15°1	0°62335	"	"
15°00' N. 43°00' E.—SE cor. sec. 3.	51	27	3	3	Aug.	12, '13	13°4—14°3	78°07.9	15°5—15°8	0°62336	"	"
25°00' S.—NE cor. sec. 23.	17	5	4	4	"	13, '13	14°0—14°9	07°9	13°7—14°0	0°62128	"	"
25°00' S.—NE " " " "	17	5	4	4	July	4, '13	7°6—8°6	03°4	14°3—14°7	0°62128	"	"
16°00' W.—NE cor. sec. 36.	12	6	4	4	Sept.	20, '13	13°1—15°0	75°39.1	7°9—8°3	0°62455	"	"
8°00' S.—NE " " " "	18	10	4	4	"	20, '13	14°5—17°4	39°8	13°9—14°4	0°61746	Blair Gray....	T. S. 61.
10°00' W. 28°00' N.—SE cor. sec. 19.	33	10	4	4	"	20, '13	16°8—17°4	42°2	15°1—15°7	0°61850	"	"
10°00' W. 28°00' N.—SE " " " "	33	10	4	4	"	23, '13	15°9—17°5	29°5	15°8—16°6	0°61512	G. A. Bennett..	"
10°00' W. 28°00' N.—SE " " " "	33	10	4	4	"	9, '13	14°9—15°9	31°6	16°5—17°0	0°61957	Blair Gray....	"
30°00' E.—NE cor. sec. 24.	15	11	4	4	Aug.	5, '13	7°4—9°4	21°8	8°2—8°8	0°61396	G. A. Bennett..	"
10°00' W. " " " "	15	11	4	4	Sept.	7, '13	7°3—8°2	76°24.2	7°0—7°3	0°62084	Blair Gray....	"
" " " " " " " " " "	15	11	4	4	"	7, '13	7°3—8°2	24°8	7°6—7°9	0°62080	E. J. Wight....	T. S. 62.
10°00' W. " " " "	17	13	4	4	Aug.	5, '13	14°1—15°9	75°08.3	8°2—8°5	0°61515	"	"
" " " " " " " " " "	17	13	4	4	July	28, '13	15°3—17°3	08°2	14°6—15°2	0°61386	Blair Gray....	T. S. 61.
" " " " " " " " " "	17	13	4	4	"	"	9°1—10°9	24°2	16°1—16°8	0°61492	"	"
" " " " " " " " " "	17	13	4	4	"	"	10°4—12°1	25°0	9°7—10°3	0°61335	"	"







SESSIONAL PAPER No. 25b

## APPENDIX No. 59.

## RESULTS OF WATCH TRIALS.

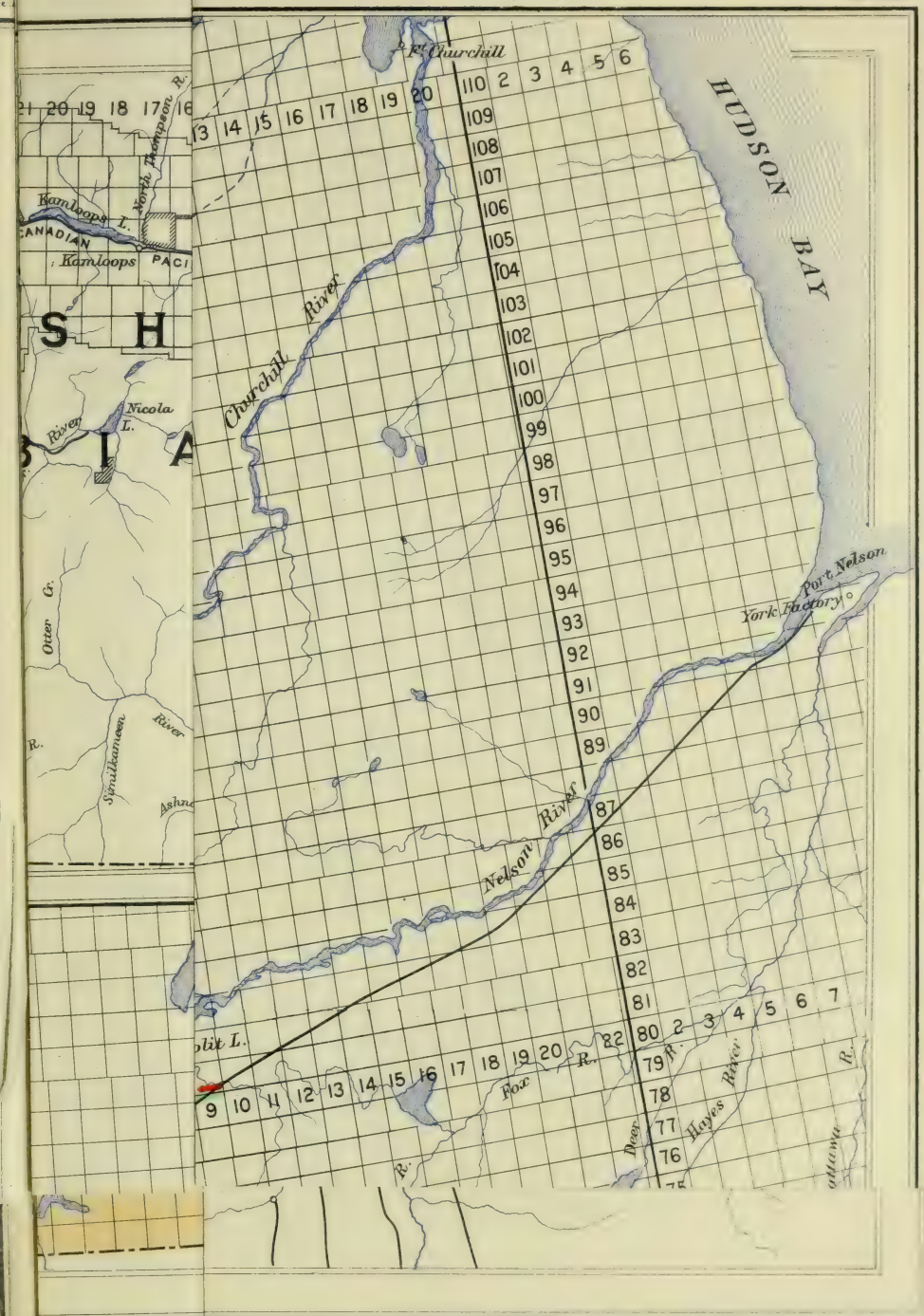
Name.	Number of Watch.	Escapement, Balance spring, &c.	Mean daily variation of mean daily rate.										Diff. between m.d.r. and m. of m.d.r. at 65° F.					Mean Error.	M. ch. of r. for 1° F.	Total Marks 0-1000.
			Mean Error.										Diff. between m.d.r. and m. of m.d.r. at 65° F.							
			P. U. 65°	P. R. 65°	P. L. 65°	D. U. 40°	D. U. 65°	D. U. 90°	D. D. 65°	P. U. 65°	P. U.	P. R.	P. L.	D. U.	D. D.	P. U.				
Waltham Watch Co.	19001012	D r., g. b., i.e., s.o.	0.32	0.48	0.23	0.23	0.57	0.22	0.24	0.30	0.32	-0.18	-1.98	+0.58	+0.58	+0.52	+0.50	0.72	0.09	687.0
"	18091089	"	0.46	0.42	0.09	0.44	0.34	0.42	0.10	0.15	0.30	+0.21	-2.09	-2.17	+1.91	+1.27	+0.85	1.42	0.07	631.0
"	18028560	"	0.28	0.16	0.64	0.41	0.40	0.57	0.37	0.12	0.37	+2.67	3.13	+2.17	-0.13	-1.37	-0.23	1.62	0.06	577.5
"	18091036	"	0.33	0.18	0.59	0.43	0.55	0.25	0.22	0.16	0.34	-2.08	-2.11	+0.84	+3.02	+1.10	-0.72	1.65	0.08	576.8
"	52	"	0.34	0.26	0.12	0.50	0.48	0.60	0.21	0.25	0.34	+2.67	4.57	+0.35	-1.15	+0.31	+2.39	1.91	0.08	547.1
"	15	"	0.42	0.12	0.23	0.36	0.29	0.24	0.24	0.22	0.26	+3.67	2.31	-1.85	-2.75	-0.11	+3.37	2.34	0.10	527.2
"	94	"	0.50	0.44	0.40	0.45	0.39	0.34	0.24	0.30	0.38	+2.35	-1.57	-2.07	-2.09	-1.27	+1.45	1.80	0.12	511.6
Hamilton Watch Co.	688005	"	0.18	0.49	0.15	0.63	0.36	0.46	0.22	0.34	0.35	-0.17	-5.37	+2.35	-2.11	+3.13	+2.17	2.55	0.03	501.9
Waltham Watch Co.	19001065	"	0.56	0.57	0.31	0.33	0.58	0.44	0.14	0.31	0.40	-1.78	-0.62	+3.98	+1.36	+0.54	-3.46	1.96	0.10	496.0
"	18091079	"	0.64	0.21	0.44	0.23	0.56	0.74	0.30	1.10	0.49	-0.07	+2.57	-4.67	+1.01	-1.81	-0.63	1.79	0.09	474.1
"	27	"	0.35	0.50	0.15	0.75	0.76	0.16	0.26	0.44	0.42	-1.86	+4.76	+1.26	-1.70	-2.28	-0.20	2.01	0.14	453.0
"	38	"	0.61	0.85	0.54	0.12	0.84	0.30	0.26	0.19	0.46	-2.04	-2.42	+1.64	+2.42	+1.60	-1.22	1.89	0.13	452.0
"	18091083	"	1.47	0.45	0.39	0.37	0.41	0.27	0.31	0.91	0.57	+0.90	-0.52	-5.52	+1.38	+3.46	+0.28	2.01	0.06	426.3
"	33	"	0.70	1.03	0.42	0.49	0.28	0.26	0.32	0.38	0.48	+3.58	-0.98	-4.78	+0.30	+0.90	+2.78	2.22	0.10	423.6
"	18028541	"	0.60	0.76	0.20	0.28	0.59	0.44	0.13	0.38	0.42	+4.43	-0.63	-1.47	+0.09	-6.93	+3.25	2.80	0.06	416.0
"	18091028	"	1.65	0.43	0.74	0.34	0.39	0.34	0.36	0.47	0.59	+1.01	+2.41	-4.07	+0.49	+1.65	-1.51	1.85	0.09	412.8
"	19001067	"	0.57	1.14	0.31	0.74	0.50	0.56	1.18	0.33	0.67	-1.35	-1.99	-1.21	+1.75	+3.49	-0.69	1.75	0.06	402.7
"	18091046	"	0.36	0.41	0.46	0.26	0.37	0.29	0.27	0.19	0.33	+4.30	-1.34	-0.48	-2.96	-1.48	+1.98	2.09	0.11	385.1
"	82	"	0.56	0.44	0.86	0.39	0.69	0.39	0.41	0.90	0.58	+1.86	-0.94	-2.22	+3.02	+1.20	-3.02	2.06	0.11	381.9
"	74	"	0.94	0.48	0.78	0.50	0.64	0.26	0.18	0.58	0.54	+1.46	-2.62	-3.54	+2.98	+0.96	+0.76	2.05	0.15	377.7
"	45	"	0.20	0.32	1.02	0.66	0.20	0.50	0.57	1.14	0.58	+4.30	-4.00	-2.48	-1.30	+3.44	+0.02	2.59	0.06	354.7
Hamilton Watch Co.	965620	"	0.64	0.84	0.32	0.40	0.28	0.44	0.41	1.16	0.56	-0.68	-7.38	+5.22	+1.32	+0.88	+0.62	2.68	0.14	301.7
Waltham Watch Co.	18091050	"	0.90	0.54	0.15	0.81	0.64	0.16	0.41	0.76	0.55	+2.70	-0.30	-5.96	-0.82	-1.98	+6.38	3.02	0.12	281.5







Scale, 35 miles to an inch  $\frac{1}{2217600}$



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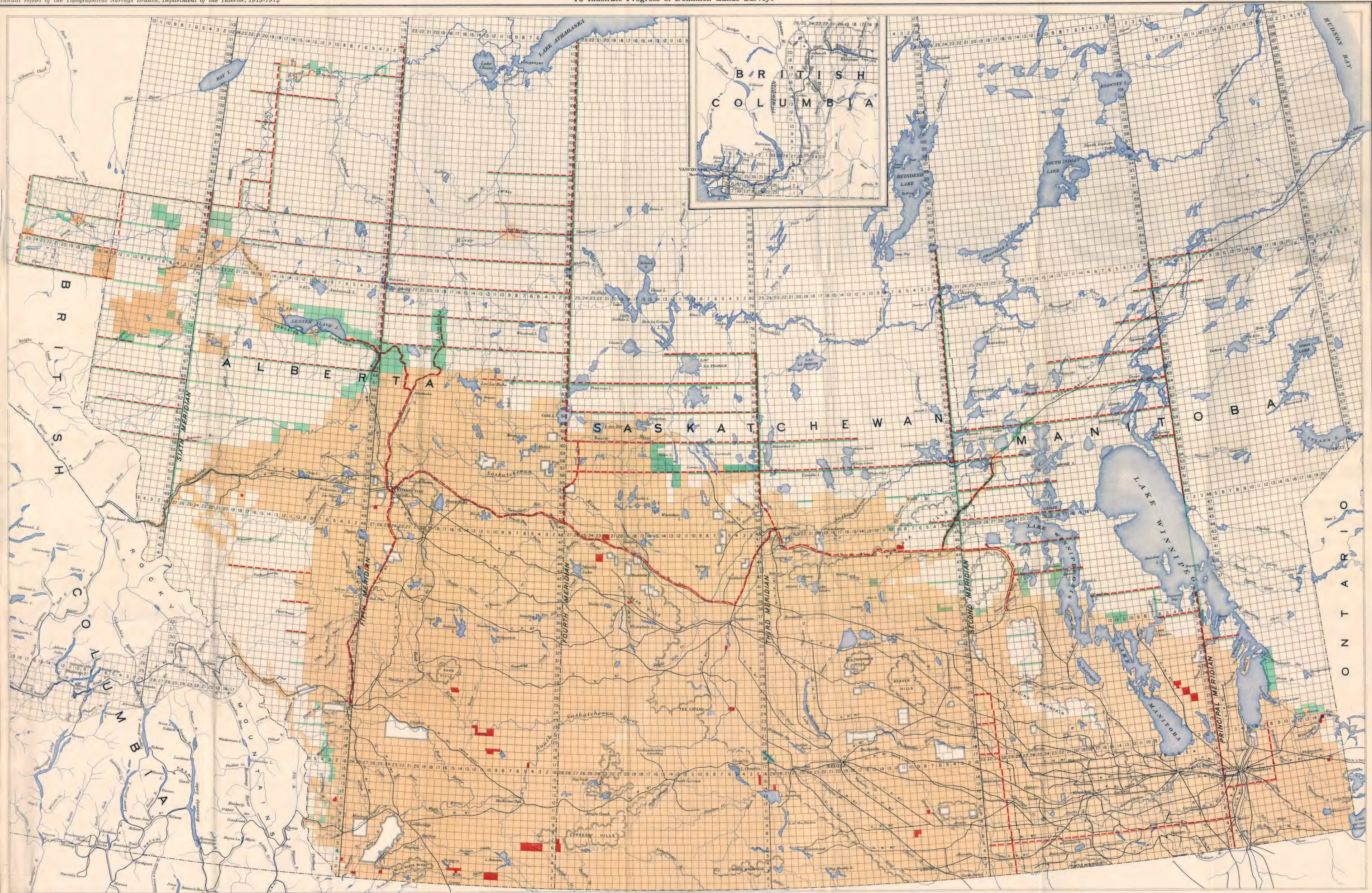
# INDEX TO TOWNSHIPS IN MANITOBA, SASKATCHEWAN, ALBERTA AND BRITISH COLUMBIA

Annual report of the Topographical Surveys Branch, Department of the Interior, 1913-1914

UNIVERSITY OF MANNING

To Illustrate Progress of Dominion Lands Surveys

Scale, 35 miles to an inch



Subdivision surveys made prior to March 31, 1913.....

Subdivision surveys made from April 1, 1913 to March 31, 1914.....

Resurvey made from April 1, 1913 to March 31, 1914.....

CAUTION:—This is only an index, topographical and other features are not to be depended upon.

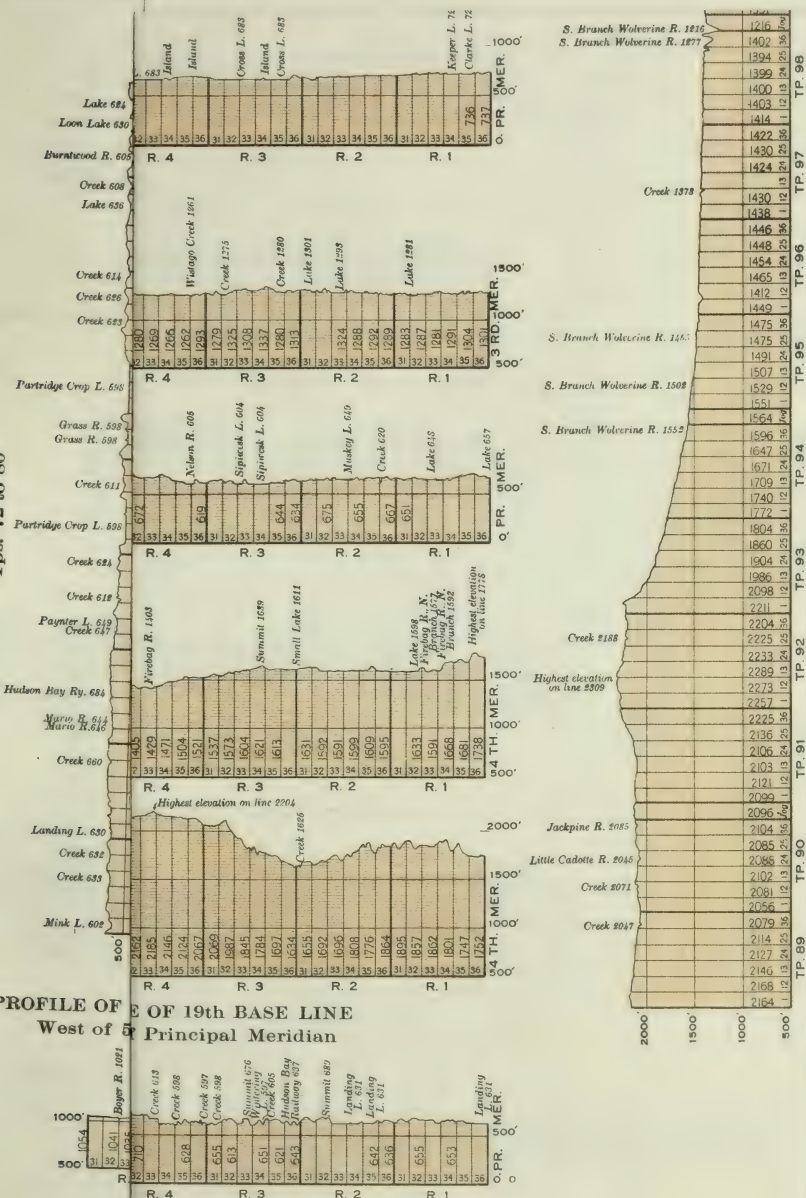
Surveys in the Railway Belt in British Columbia are not shown owing to their scattered nature.

Lines of spirit levels run prior to March 31, 1914

Base and meridian lines run prior to March 31, 1914



NE Rs. 11 to 27 and  
ett, D.L.S., 1913

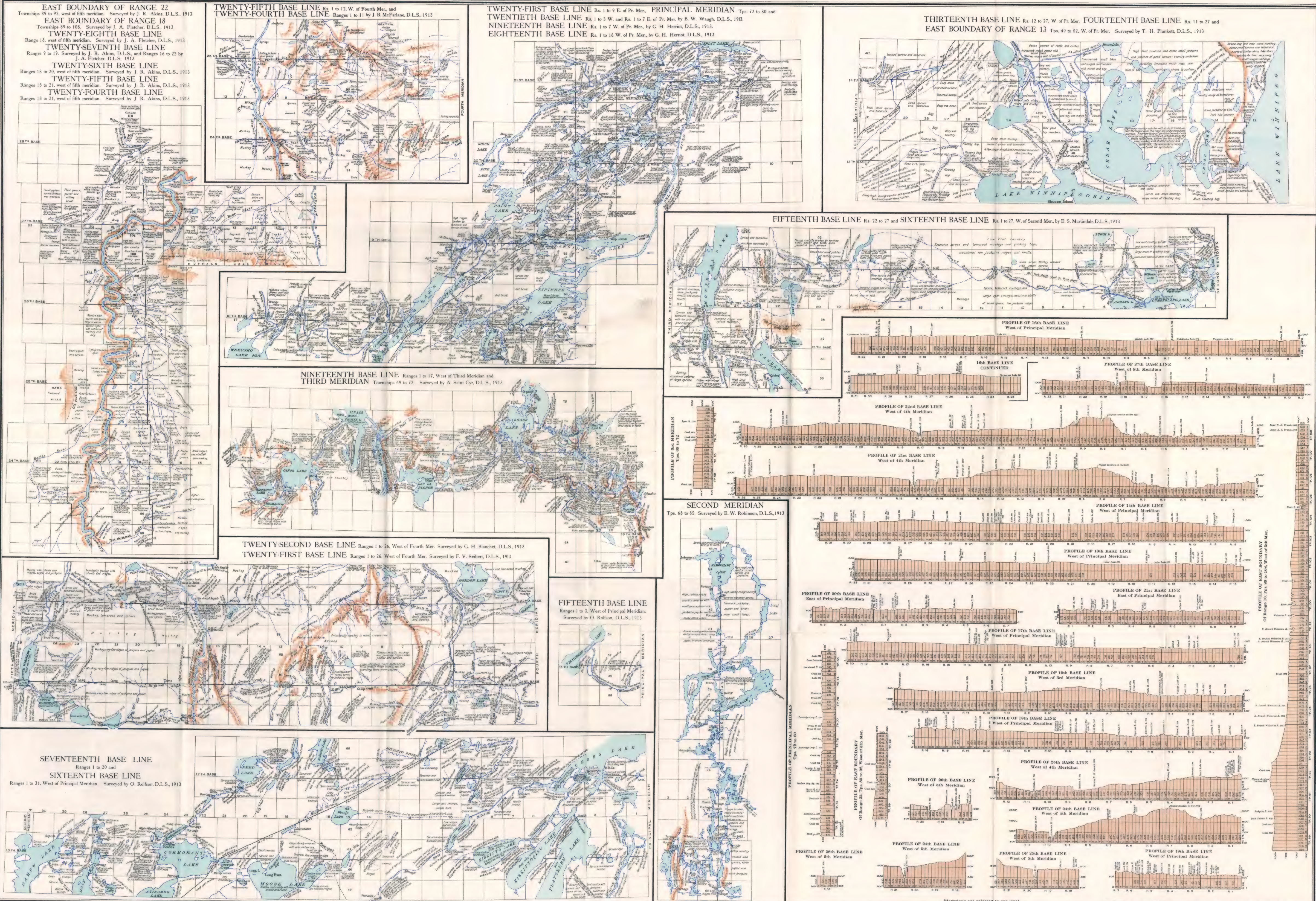


TO AN INCH. VERTICAL SCALE OF PROFILES, 2,000 FEET TO AN INCH



# SKETCH MAPS and PROFILES of BASE LINES and MERIDIANS

Annual report of the Topographical Survey Branch, Department of the Interior, 1913-1914





DEPARTMENT OF THE INTERIOR

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ANNUAL REPORT

OF THE

TOPOGRAPHICAL SURVEYS  
BRANCH

1914-15

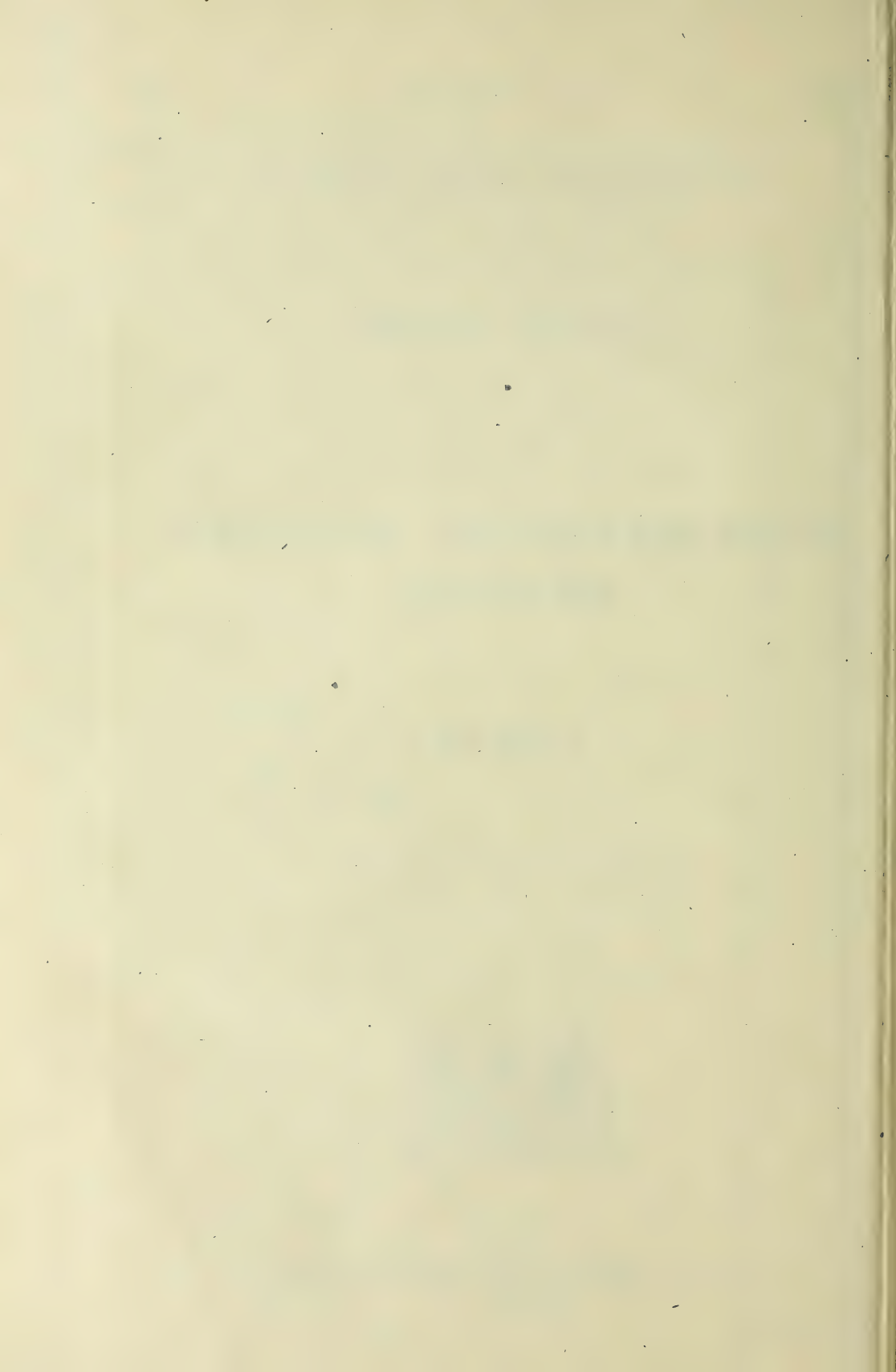
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1916







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# REPORT OF THE SURVEYOR GENERAL OF DOMINION LANDS 1914-15

DEPARTMENT OF THE INTERIOR,

TOPOGRAPHICAL SURVEYS BRANCH,

OTTAWA, August 9, 1915.

The Deputy Minister of the Interior,  
Ottawa.

I have the honour to submit the following report of the Topographical Surveys Branch for the year ended March 31, 1915.

The progress during the past year and the general extent of the surveys at its close are illustrated by maps which accompany the report in monograph form.

In the parliamentary appropriations for the fiscal year 1914-15 provision was made for the continuance of Dominion land surveys on practically the same scale as for the previous year; the total appropriation for this purpose being \$1,047,000.

## BLOCK OUTLINES.

During 1913 the tide of settlement set in strongly towards Peace River district. Extending northerly from this, Peace and Athabaska rivers afford two natural high-ways for the progress of future settlement. This northerly country is to a large extent unknown and unexplored. Reports so far received indicate that it is mostly wooded, but that extensive swamps occur frequently, with here and there tracts of good agricultural land. Much of the land is unsuitable for settlement, but it is impossible to foresee where future settlement will take place. In order that the department may be in a position to proceed with subdivision surveys wherever required, the system of base lines and initial meridians has been extended into the unexplored districts. As these lines form the basis for all surveys which follow, they must be established with the greatest care and accuracy. Although the surveys are carried on remote from settlement, and practically no means of communication exist with civilization, the work is carried on with great precision. The surveyor is furnished with first-class equipment in instruments, and no surveys excepting those made in geodetic work are carried out with greater refinement. Good results are being obtained, and are largely due to the attention which the surveyors devote to the many smaller, yet not unimportant, details of the work. A party of twenty-three men in charge of a Dominion land surveyor is employed on each base line or meridian surveyed. In addition to the survey of the actual line the country for a distance of twelve miles on either side is explored; from the explorers' reports, maps are prepared which show the topography of the district, the kind and quality of the timber, and the nature of the soil. Simultaneously with the surveys of the block outlines, levels of the lines are taken; these form parts of a great network of levels which is being extended over the entire country.

Four parties were employed during the year on the survey of block outlines in northern Alberta. The 29th base line (between townships 112 and 113) was surveyed



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from the Fifth to the Sixth meridian, a distance of 140 miles. This line passes about twenty-five miles north of Fort Vermilion, where it crosses the summit of Caribou mountains. These are lightly wooded with stunted spruce, and the surface is covered with deep moss, underneath which the ground remains frozen from year to year. Bears and caribou are plentiful, and fish abound in several small lakes. The surrounding country is gently rolling and covered with small spruce and poplar. The soil is good and grass plentiful.

The 26th base line (between townships 100 and 101) was established easterly from Peace river to the Fifth meridian, and the 27th was continued easterly from range 8 to the meridian. When cleared, most of this district will make splendid farming land, but at present it is covered with windfall and *brulé*. The land being generally level, extensive drainage will be necessary to drain the swamps and make the country accessible. A third party projected the survey of the 26th base (between townships 100 and 101) from the Fourth to the Fifth meridian, approximately 150 miles. This line is situated about forty miles north of McMurray, and crosses Birch mountains about fifteen miles west of Athabaska river. Between the river and the mountains the soil is good, and in places the timber is excellent. West of the mountains a surface of moss covers a mass of boulders embedded in clay.

The survey of the 24th base (between townships 92 and 93) and the 25th base (between townships 96 and 97) were continued westerly from Athabaska river to the Fifth meridian. A large portion of the district west of Athabaska river is occupied by Birch mountains, an extensive elevated plateau covered with boulders. The surface has been burned over and is now covered with windfall and scrub. Several extensive muskegs were met with. Legend lake, about nine miles long and three miles wide, contains an abundant supply of fish. It is so named because of a superstition held by the Indians that the lake is the abode of monsters.

To prepare for settlement along the line of the Hudson Bay railway, which, to a limited extent, is expected to follow the construction of this line, three parties were occupied in pushing forward the system of block outline surveys in northern Manitoba.

The Principal meridian was continued northerly from township 80 to township 88 through a formerly unknown country. The surface, though gently rolling, is a series of muskegs, mossy sloughs, and floating bogs, covered with windfall and second-growth spruce and tamarack. Drainage, which must precede settlement, is comparatively easy owing to the numerous creeks and rivers.

The same party retraced the Second meridian from township 56 to township 85. This retracement was necessary to determine the correct bearings and chainages for the line, as many of the records of the original survey had been destroyed by a fire in the survey camp shortly before the close of field operations.

The two remaining parties surveyed short portions of base lines and meridians in the vicinity of the right of way from Split lake northeasterly to Port Nelson. This district is mostly level with intersecting ridges, the surface being largely muskeg or tamarack swamps drained in part by Nelson river. The soil is a deep clay loam overlaid with moss; it will not be suitable for agriculture until the moss has been removed. The timber, which is sparse, consists mostly of burned spruce and bluffs of green poplar. Port Nelson is the proposed terminus of the Hudson Bay railway. At the time of the survey, five hundred men were employed on the construction of the harbour there.

To prepare for this subdivision in the near future, of the lands adjacent to the easterly shore of lake Winnipeg, a party was sent to establish short portions of the base lines in that vicinity. About one hundred miles of line were surveyed. Forest fires were prevalent and destroyed large areas of timber. The land near the lake is generally level, the surface being a succession of swamps, muskegs, and low rock



## SESSIONAL PAPER No. 25b

ridges. The muskegs are not deep, and the bottom is generally clay with more or less muck, but owing to the difficulty of drainage it is doubtful if this district will be settled in the near future. Silver and black foxes are plentiful.

## TOWNSHIP SUBDIVISION.

As township subdivision is well in advance of settlement, surveys of this nature were considerably curtailed during 1914. Eighteen parties only were employed on subdivision at contract rates, whereas twenty-seven parties were employed on similar surveys the previous year. Eleven of the parties worked in the Peace River district west of Lesser Slave lake, where settlement was proceeding rapidly. In all the townships subdivided the soil is good and well suited for agriculture.

A few townships were subdivided by a party under contract around Wabiskaw lake, where several settlers had already located. This district will rapidly fill up when railway facilities are provided.

Subdivision of the lands adjacent to Athabaska river was continued, and these lands are now open for settlement as far north as township 94 or about thirty miles north of McMurray.

A few townships were surveyed in Manitoba to open up the lands ahead of settlement north of lake St. Martin and in the vicinity of Washow bay. One party was employed at each place.

Subdivision surveys being well ahead of settlement in Saskatchewan, no contract surveys were allotted in that province.

In addition to the eighteen parties employed under contract, fourteen parties were employed under daily pay for subdivision surveys which were of such a nature that they could not conveniently be executed under contract at the regular rates fixed by Order in Council. The principal surveys of this nature made during the year were at or near the following places: Fort Vermilion, in northern Alberta; Fort St. John and Hudson Hope, in the Peace River block; Peace River Crossing; Rocky Mountain House; Atikamek lake, north of Lesser Slave lake; along the Hudson Bay railway, and in the Railway Belt, British Columbia.

Surveys along the Hudson Bay railway now extend as far north as township 70, range 5, west of the Principal meridian.

Most of the surveys in the Railway Belt were undertaken at the request of the Dominion Lands agents. In addition to regular township subdivision, the survey parties in British Columbia make all necessary surveys of mineral claims and town and village sites: they also retrace the boundaries of previously surveyed Indian reserves and provincial lots. In districts where the land is most valuable the department disposes of it in parcels of forty acres or less. As the regular township subdivision in these cases is not sufficient to enable the owners to determine the boundaries of their holdings, an effort is made to survey two or more boundaries of each parcel and to mark at least two corners on the ground.

I regret to report that while engaged on surveys along the bank of Nahatlatch river, Mr. A. E. Hunter, D.L.S., lost his balance on a high precipice overlooking the river, and was drowned. His body was recovered several days after and brought to his home in Wiarton, Ontario, for interment.

Subdivision surveys of Dominion lands at the present time are much more elaborate than formerly: consequently the rates per mile for surveys under contract are considerably higher. To ascertain how subdivision surveys executed by parties under daily pay compare as to cost with similar surveys under contract, a party under daily pay was employed during the season on subdivision surveys under conditions as near as possible to those under which contract work is carried on. The place selected was a block of townships near Athabaska river, about thirty-five miles northeast of Athabaska. Although the surveyor lost part of his equipment by a canoe accident, and in spite of the fact that considerable time was spent in building roads, the cost per mile of his surveys was below the average cost per mile of surveys in the same district made at contract rates.



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It is the intention to introduce a number of improvements in our methods of survey. All section lines in a township will now be surveyed and a few lines of levels run in each township. The survey of all the section lines will enable the settlers in the more or less wooded districts to find their lines with little difficulty, while the levels will be valuable later in the preparation of drainage schemes, highways and for other purposes.

#### INSPECTION OF SURVEYS.

The surveys executed under contract have been carefully inspected to determine if the work had been accurately performed and if the charges for doing the work were in accordance with the terms of the contract. Five inspectors were employed for this purpose, and their reports show that the contractors have done their work carefully and in conformity with the requirements.

When inspectors are not engaged on inspection work they occupy their time as far as possible in the performance of subdivision and miscellaneous surveys. During last season one inspector visited the camps of several surveyors in charge of parties under daily pay. He examined their instrumental equipment and their outfits and reported thereon to the office, as well as on the work performed and the general fitness of the surveyor to have charge of survey parties.

#### INTERPROVINCIAL BOUNDARY SURVEYS.

The delimitation of the boundary between the provinces of Alberta and British Columbia, begun in 1913, was continued last season under the same three commissioners as formerly. Two parties were employed on the survey, one under each of the commissioners appointed by the provinces: one party surveyed the boundary line and erected the boundary monuments; the other made a photo-topographical survey of the country on both sides of the boundary. The representative of the Dominion visited the parties occasionally to keep in touch with the progress of the work and to confer with the other commissioners on questions where difficulties or disputes might arise.

The boundary was established across Crowsnest and North Kootenay passes, and fifty-nine boundary monuments erected. Preliminary survey was commenced at South Kootenay pass.

#### LEVELS.

During the year four thousand five hundred miles of lines of levels were run, making the total mileage of levels up to the present time, nine thousand eight hundred. A publication is now in the hands of the printers giving in tabulated form the information collected by our surveyors for 7,400 miles of the levels already taken. It is expected that this publication will fill a long felt want, as it will contain much information that will prove invaluable in the development of new areas, in the reclamation of swamp lands, in the extension of railway systems, in the development of water areas and in many other public and private undertakings.

#### TOPOGRAPHICAL SURVEYS.

The topographical survey of the portion of Jasper park in the vicinity of Jasper, begun in 1913, was continued. The flats of Athabaska and Miette rivers, and the rolling country behind the flats were surveyed for a distance of approximately five miles on each side of the town. The survey was made by means of the plane table, and from the information collected it will be possible to prepare a contour map of the district with intervals of ten or twenty feet. The map will be most useful in planning improvements and public works for the development of the park. The attractiveness of the place is greatly enhanced by the numerous small lakes scattered over the area surveyed.



## SESSIONAL PAPER No. 25b

The topographical survey of Crowsnest forest reserve made at the request of the Forestry Branch was completed, and the publication of the map of the reserve is now being proceeded with. An area of approximately seven hundred square miles was surveyed, comprising the eastern slope of the Rocky mountains southerly from the Canadian Pacific railway to the international boundary. Large deposits of coal occur within the reserve, but only those near the railway are being worked as yet. An oil-well, bored to a depth of 970 feet, yields from fifteen to eighteen barrels of crude oil a day.

Topographical surveys were considerably retarded by high winds and smoke from forest fires. During a season comprising one hundred and twenty-five days, forty-six days were totally unfit for work, while several others were unfavourable to good results.

## STADIA SURVEYS.

Twelve parties were employed on stadia surveys of water areas in the portions of Saskatchewan and Alberta, which were subdivided many years ago. At the time of the original surveys many bodies of water existed which have now partially or entirely dried up leaving considerably more land available for settlers. In some instances bodies of water are found which did not exist, or were not noticed by the surveyor when subdividing the townships: in other instances the courses of rivers are found to have greatly altered. Each township is carefully examined by a stadia party, and with the information collected we are able to issue new township plans representing conditions as they are at present. During the year, 605 townships were examined, and 2,733 miles of traverse made by the stadia parties alone.

## CORRECTIONS AND RESURVEYS.

In making the subdivision of Dominion lands, wooden posts have been employed to a very large extent. Previous to 1883, iron posts were used to mark township corners only, while from 1883 to 1889 they were also used to mark section corners in prairie, while wooden posts were used in bush. From 1890 to the present all township and section corners have been marked by iron posts. Quarter-section corners were first marked by iron posts about 1908. From this it is evident that up to six or seven years ago wooden posts were very extensively used as monuments.

Although sound wooden posts were invariably chosen, their existence as monuments was of very short duration. They decayed rapidly and were often broken. Again, iron posts are frequently removed by persons, who perhaps do not understand the purpose they serve, or by others who are interested in destroying evidence of the survey. In making improvements, homesteaders often plough over monuments, thus destroying them. The destruction of monuments is an indictable offence punishable by imprisonment. Although a reward of fifty dollars has been offered for evidence of offences, very few convictions have been secured, and the removal of posts and destruction of monuments continue. A form of iron post, which will be much more difficult to remove, is being made at present.

When the survey monuments have disappeared to any considerable extent, new settlers experience much difficulty in determining the limits of their homesteads. Resurvey under the provisions of clause 58 of the Dominion Land Surveys Act are undertaken in townships now being colonized, when investigation shows that such a survey is necessary to determine the boundaries of the various quarter-sections. In townships where a large portion of the land is patented and has passed under provincial jurisdiction, resurveys are not undertaken, as the perpetuation of the monuments, in such cases, is the duty of the owners of the lands.

Surveys of twenty or thirty years ago were not made with the same care and precision as is practised to-day. On examination of those surveys, it is often found that the bearings and chainages are very erroneous, and the area of quarter-sections is



considerably larger, or smaller, than returned by the surveyor. Owing to these irregularities of survey, it often happens that adjoining homesteads differ in area by as much as fifty or sixty acres, which gives rise to much dissatisfaction among the settlers, and litigation often results. Errors in the survey of settled lands can be corrected only under the authority of section 57 of the Dominion Lands Surveys Act.

The Department of Justice has recently ruled that sections 57 and 58 of this Act are not applicable to lands which passed from the control of the Dominion prior to the date the Act was assented to, viz.: March 17, 1908, unless authorized by the Legislature of the province in which the lands are situated. Acts authorizing these surveys have been passed by the provinces of Alberta and Saskatchewan, but up to the present Manitoba has not done so.

Three parties were employed on the resurvey of townships under the provisions of section 58 of the Dominion Lands Surveys Act. Fourteen townships were either wholly or partly resurveyed. These parties also made surveys of a miscellaneous nature, such as extending subdivision lines over the dried-up beds of lakes, which originally covered large areas. They established monuments to mark various corners made accessible by the partial drying up of lakes.

One surveyor with an assistant only, was employed throughout the season in travelling over the country attending to complaints, correcting errors, erecting monuments and making various adjustments which did not involve much work. Towards the close of the season, when their other surveys had been completed, two other surveyors, each with an assistant, were employed at similar miscellaneous work.

The surveys of base lines and meridians made many years ago, when instruments and methods were not sufficiently accurate, are often found to be quite erroneous. Errors as great as twenty-seven chains in distance and seventeen chains in direction have been discovered. In order to determine the exact location of the monuments existing along such lines, a retracement survey is necessary. This work was commenced in the season of 1912, and has been continued during each successive season.

In 1914, one party was employed on the retracement of the second base line (between townships 4 and 5) between the Second and Fourth meridians, and of the Fourth meridian from the international boundary to township 54. This party retraced over 700 miles.

The council of the city of Prince Albert asked for a resurvey of the river lots in Prince Albert settlement. Where most of the lands affected are private property, the usual answer to requests for resurveys in cases of this kind is that the Dominion Government has no interest in the lands and any resurvey that may be required must be made by the province under the authority of the provincial laws.

The case in question, however, was very exceptional. The survey was made a long time ago and the records were imperfect; there seemed to be justification for the departure from the general rule. The difficulties cited by the city council seemed to be due mostly to the disappearance of the marks of the original survey and to imperfections in the plan of the same. It was considered that the proposed resurvey would remove the difficulties.

Accordingly, one party made a retracement survey of part of the settlement and the surrounding townships. They also resurveyed a township under the provisions of section 58 of the Dominion Lands Survey Act, and subdivided a portion of Sturgeon Lake Indian reserve No. 101, which had been surrendered to this department.

#### LATITUDE OBSERVATIONS.

One party, consisting of a surveyor and one man, observed for latitude on the Fourth meridian near lake Athabaska, at the intersections of Peace river with the Fifth and Sixth meridians, and also on the Sixth meridian near the 23rd base line. For this work the surveyor was supplied with special instrumental equipment including zenith telescope.



## SESSIONAL PAPER No. 25b

## SETTLEMENT AND TOWNSITE SURVEYS.

In 1908, the townsite of Churchill was surveyed and the general scheme for the town plot was laid out. The boundaries of the streets and blocks were established but time did not permit the surveyor to subdivide the blocks into lots that season and to post them properly.

A portion of the townsite having been disposed of, it was necessary to complete the work which had been left unfinished.

The trip from Pas to Churchill required from March 11 to April 13. From Pas the party travelled on the Canadian Northern railway to the end of steel, a distance of about 85 miles, and proceeded along the right-of-way, a distance of 155 miles. During this portion of the trip, horses were used, but from that point five teams of five dogs each were used as a means of transport. From ten to thirty miles were travelled each day, depending on the character of the country and the depth of the snow. High winds delayed progress considerably, and Port Nelson was reached about April 1. From there the party went directly across country to Churchill, the usual custom being to follow the coast line. During this part of the trip, they suffered considerably from frost bites as there was a scarcity of wood for fuel.

The return journey was commenced on August 25, and a few days were spent at Port Nelson attending to matters regarding transportation. The party left that point on September 5, and reached North Sydney, Cape Breton, on September 14.

The townsite is situated on a rock and gravel bed. The country around Churchill is quite barren, but there is considerable spruce and tamarack near Churchill river. Grass grows near the edges of the rivers and lakes. The summer season is very short, commencing August 1, and lasting about six weeks. The spring is cold and wet, snow storms occurring during June.

One party was engaged in surveying settlements along Mackenzie river at Forts Providence, Wrigley, Simpson, Norman and Good Hope, at Hay river and Fort Resolution, which are situated near Great Slave lake, and at Pelican settlement on Athabaska river. Most of the inhabitants of these places are Indians and half-breeds, whose chief occupation is hunting. The party engaged at this work remained in the field from the spring of 1913 to the fall of 1914.

Winter sets in early in the northern country, and Mackenzie river was completely frozen over on November 18. When the ice is forming, drift-ice piles up in huge masses wherever the current is swift, and then becomes frozen solid. This forms an extremely rough surface for dog teams to travel upon. The surveyor had to cut several miles of trail through the ice, often necessitating the making of a road through walls of ice, eight feet high and four feet thick. During the months of January and February, the temperature varied from 30° to 60° below zero, and no surveying was done. During this time the surveyor and assistant were employed at the preparation of returns, while the men secured wood for fuel, which was scarce and had to be brought a considerable distance.

During the summer the climate throughout the north is ideal, and is not liable to sudden changes. The weather is very warm in July and August, but there is sufficient rainfall to keep the ground in excellent condition for the growth of grain and vegetables. The wet season extends from the latter part of August to the middle of September, when frosts occur frequently, and snow falls occasionally at the end of August.

Moose, caribou, and bear are quite plentiful, while mountain sheep and goats roam over the mountain slopes. During the summer season, ducks, geese, ptarmigan, and partridges can be obtained with but little difficulty. Fish in abundance may be had in all bodies of water of any considerable size. Splendid whitefish, trout, pike and many other varieties are very plentiful in Mackenzie river and in Great Bear and Great Slave lakes.



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At all the points visited, all vegetables, excepting tomatoes and melons, are successfully grown. They attain good size and are of splendid quality. Even at Fort Good Hope, on the verge of the Arctic Circle, splendid gardens were seen. Raspberries, cranberries and blueberries grow in abundance throughout the north. Farming is carried on to a small extent at Forts Resolution, Simpson, and Hay River, where wheat and oats have been successfully raised. Barley and oats are grown at Fort Providence, and barley at Fort Norman. A well-equipped saw-mill is located at Fort Resolution, and another at Fort Simpson. These furnish shingles and lumber for the inhabitants. The R.N.W.M. Police have detachments stationed at Forts Resolution and Simpson. Besides preserving order, they assist the fire patrols, and forest fires are now decreasing in number. A large mission school, where Indian and half-breed children are educated, is conducted at Fort Providence. Copper deposits exist in the vicinity of Forts Resolution and Good Hope, and galena has been found near Fort Resolution.

At the request of the Dominion Parks Branch, many surveys of a miscellaneous nature were made in the Yoho and Rocky Mountains parks. One party was engaged on this work throughout the season, and another for a few months. Various road location surveys were made, and levels taken in the vicinity of Banff, Field, and Lake Louise. The Calgary-Banff automobile road was traversed, and levels taken for a distance of twenty-two miles. Cemeteries were laid out at Bankhead and Field; Canmore townsite was re-surveyed. Surveys of the villa-lot section and the townsite at Banff, commenced last season, were also continued. This work was made to conform with designs submitted by Mr. Mawson, town-planning expert.

#### TIMBER BERTHS.

Under the present regulations, timber berths are surveyed by the department before they are offered for sale. The cost of the survey in each case is included in the upset price of the berth. During the season, three berths were surveyed, according to instructions issued from this office, necessitating the establishment of approximately twenty-three miles of timber-berth boundaries. Two of these berths were surveyed by surveyors employed under daily pay. Tenders were received for the survey of the third, and the work was allotted to the surveyor submitting the lowest tender.

#### MINERAL CLAIMS.

Every mineral claim is designated by a lot number in the group to which such lot belongs. The claimant, after staking his claim, is required to apply to the Surveyor General to have instructions issued to a Dominion land surveyor to have the boundaries of the claim run out, measured, and marked on the ground. Lot and group numbers for the claim are furnished with the instructions. After completing the work on the ground, the surveyor must forward to the Surveyor General a plan of the claim on tracing linen, together with complete field notes. He must furnish, as well, the necessary duplicates, the plans for filing with the mining recorder and for posting on the claim.

During the past season, surveys were made of sixty-seven mineral claims, nine being located in the Yukon territory. Returns were also received for eight mineral claims surveyed in 1912, and for thirty-six surveyed in 1913. All of these were located in the Yukon territory, and the survey returns were not completed in time for previous reports.



## SESSIONAL PAPER No. 25b

## YUKON SURVEYS.

Dominion land surveys in the Yukon territory are under the direction of a Director of Surveys who has his office at Dawson; he has a staff of two draughtsmen. During the year, 113 miles of base lines and traverses were surveyed. The work was mostly in connection with mining claims.

## STATEMENT OF MILEAGE SURVEYED.

The following is a comparison of the mileage surveyed each year since 1912:—

Nature of Survey.	April 1, 1912, to March 31, 1913.	April 1, 1913, to March 31, 1914.	April 1, 1914, to March 31, 1915.
	Miles.	Miles.	Miles.
Township outlines .....	2,718	3,760	3,270
Section lines.....	10,365	7,918	7,100
Traverse.....	3,505	5,748	5,141
Resurvey.....	2,586	1,632	2,610
Total for season.....	19,178	19,058	18,055
Number of parties.....	72	66	59
Average miles per party.....	266	289	307

The following tables show the mileage surveyed by the parties under daily pay, and by the parties under contract:—

## WORK OF PARTIES UNDER DAILY PAY.

Nature of Survey.	April 1, 1912, to March 31, 1913.	April 1, 1913, to March 31, 1914.	April 1, 1914, to March 31, 1915.
	Miles.	Miles.	Miles.
Township outlines .....	1,619	2,074	2,088
Section lines.....	1,358	1,695	1,756
Traverse .....	992	4,179	3,987
Resurvey.....	2,538	1,613	2,538
Total for season.....	6,507	9,561	10,369
Number of parties .....	35	39	41
Average miles per party.....	186	245	255



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## WORK OF PARTIES UNDER CONTRACT.

Nature of Survey.	April 1, 1912, to March 31, 1913.	April 1, 1913, to March 31, 1914.	April 1, 1914, to March 31, 1915.
	Miles.	Miles.	Miles.
Township outlines .....	1,099	1,695	1,514
Section lines .....	9,077	6,214	5,012
Traverse .....	2,517	1,569	1,154
Resurvey .....	48	19	6
Total for season .....	12,671	9,497	7,686
Number of parties .....	37	27	18
Average miles per party .....	342	352	427

Owing to the nature of their work, twelve parties are not included in the statement of mileage for the year ended March 31, 1915.

## COST OF SURVEYS.

The following statement shows the average cost per mile of surveys executed by surveyors under daily pay, and by surveyors under contract:—

	Surveyed under daily pay.	Survey under contract.
Total mileage surveyed .....	10,369	7,686
Total cost .....	\$504,950 00	\$229,303 00
Average cost per mile .....	48 70	\$29 83

## CORRESPONDENCE.

The correspondence consisted of: letters received, 14,067; letters sent, 17,502.

## ACCOUNTS.

Number of accounts dealt with, 1,710; amount of accounts, \$1,046,910; number of cheques forwarded, 3,450.

## OFFICE WORK.

(*T. Shanks, Assistant Surveyor General.*)

For some years the organization of an efficient office staff has been seriously interfered with owing to the frequent changes in the personnel of our technical officers. It was felt that this was largely due to the activity in general surveying and engineering work, which provided employment with better remuneration and brighter prospects for men who were qualified by special training in technical schools or by experience in practical work. When conditions changed in the business world, it was expected that the office staff would tend to become more permanent in nature. This



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may be the result eventually, but up to the present the improvement has not been noticeable. During the past year fourteen clerks have severed their connection with our office. Three left to resume their studies at the university, four preferred field work to office work, one accepted a more attractive position elsewhere, and six were transferred to other branches or departments of the service. Fourteen men were selected by the Civil Service Commission to replace them but, while possessing the necessary educational qualifications, the new men lack the training and experience of the clerks who have gone.

To add to the difficulties caused by the unsettled condition of the staff, the office has suffered the temporary loss of twelve clerks who have enlisted for active service in the European war. Nine of these went with the first contingent and three with expeditionary forces that were recruited later. Additional recruiting will undoubtedly lead to the temporary loss of others willing to respond to the call of duty.

There has been no relaxation in the prosecution of our field work during the past year. For some time, when the flood of immigration was at its highest, there was some difficulty in carrying on field operations so as to keep ahead of the rapid development in western Canada. A sufficient number of properly qualified surveyors could not be obtained as the remuneration offered in other branches of engineering was more attractive. At present, with the exception of a few localities, the surveyors are well ahead of settlement and it is no longer difficult to obtain efficient technical assistance in carrying out our field work.

The completion of township subdivision in those districts where it had been urgently required owing to the demands of settlement, enabled the department to devote some attention to several branches of the field work which had been neglected owing to the pressure of other work. Among the divisions of the work now receiving greater attention are resurveys, stadia surveys of water areas, the securing of magnetic and astronomical data, and the taking of levels.

The resurveys are chiefly for the purpose of re-establishing corners where the original monuments have disappeared and for the correction of errors in the old surveys. These resurveys increase in difficulty with the advance in settlement. The aim of the department is to assist the homesteaders to find their true corners, but in some cases the owners of adjoining lands object to the resurvey and an awkward situation results. In other cases municipal or private improvements may have been made which would be affected by the re-establishment of the corners in correct position.

Stadia surveys of water areas have been rendered necessary by the great changes in these topographical features since the original surveys were made. In many cases areas shown on the old maps as lakes are now being subdivided into homesteads. In other cases the opposite change has taken place, and lakes which have all the appearance of being permanent are in existence over areas which were once shown as dry land. Frequently an additional reason exists for these surveys owing to the unsatisfactory nature of the water boundaries for the purpose of accurately defining the land to be granted. This difficulty does not arise where the bank is a permanent feature, but where it is subject to change it has been found advisable to substitute straight lines whose positions can be definitely located.

The work of levelling and the collection of magnetic and astronomical data can be done by our field parties at very little extra expense while carrying on the ordinary land surveys, and afford a means of securing much information of great value both from a practical and a purely scientific standpoint.

The change in the general nature of the field work and the wider scope of the investigations carried out by our survey parties have resulted in a corresponding change in the character and amount of the office work. In the earlier days of the branch the surveyors were employed principally in the subdivision of townships into sections. The office work in preparing instructions and examining survey returns was comparatively simple. The varied nature of the present surveys and the complicated



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problems to which they give rise have created a greater need for a competent and permanent staff familiar with all the intricacies of our work.

The miscellaneous or routine business of the office continues to increase. This covers such points as inquiries about the nature and capabilities of the districts surveyed, information as to the character and extent of the surveys made or proposed, correspondence and action in connection with petitions for the re-establishment of lost corners, the renewal of monuments in poor condition, the correction of actual or supposed errors in survey lines, and the furnishing of information about areas, corner monuments, etc.

Details of work in the different divisions are given in the reports below by the several chiefs, and the usual schedule of work executed during the twelve months is added in Appendix No. 4.

#### DIVISION OF SURVEY INSTRUCTIONS AND GENERAL INFORMATION.

*(H. G. Barber, Chief of Division.)*

The work of the division consists, in general, of the preparation of instructions for the surveyors who are engaged in the field operations, the entering of all survey returns in the various registers, the issuing of all preliminary plans except for the townships in the Railway Belt of British Columbia, the answering of requests for information received from the general public and from other branches and departments and the issuing of the annual report of the branch.

During the twelve months just ended the total number of draft letters and memoranda was 9,592, an increase of more than fifteen per cent over the preceding year.

Two hundred and fifty-seven drafts of instructions were issued to surveyors for the execution of various surveys; this involved the preparation of 3,410 sketches and 103 maps and tracings.

Two thousand two hundred and nineteen communications from settlers and others and inquiries from other branches and departments were dealt with. This necessitated the preparation of 455 sketches, 179 maps and plans and the copying of 345 pages of field notes. Two thousand and ninety-five sketches were also copied for the information of other branches.

Thirty descriptions of parcels of land were drafted and a number checked and revised for other branches.

Preliminary plans were issued for 275 townships. These plans allow of the land being opened for entry at once without waiting for the final examination of the surveyor's returns and the issue of the official plans. Four copies of each plan are required. Up to the present time this division has prepared these plans for all townships in Manitoba, Saskatchewan and Alberta, those for the townships in the Railway Belt of British Columbia having been made by the British Columbia Division of the branch. It has recently been decided that in future all preliminary plans are to be issued by this division. As six copies are required of each of the British Columbia plans, this will mean a considerable increase in the work of the division.

Plans of 948 townships and of thirteen townsites or settlements were received from the lithographic office, entered in the various registers and forwarded to the Survey Records Branch. Seventy-three sectional maps and 105 miscellaneous plans were also received and distributed.

During the year there were received from the surveyors in the field and entered in the office registers: 1,600 progress sketches, 382 books of field notes for townships surveys, 440 books and 1,111 plans for miscellaneous surveys, 251 timber reports, 229 statutory declarations, sixty books of azimuth observations in connection with the survey of block outlines and returns for magnetic observations and for seven timber berths. General reports were received from all the surveyors under daily pay.



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Their examination having been completed, 574 field books of township surveys and 206 books and 180 plans of miscellaneous surveys were placed on record.

For reference in the work of the office there were received from the Survey Records Branch 5,657 field books and 1,046 plans and from the Registration Branch 1,968 files.

The preparation of the third edition of the pamphlet entitled "Description of the surveyed townships in the Peace River district in the provinces of Alberta and British Columbia" has been commenced. It is expected that it will be issued in a few months. More than two thousand copies of the second edition were distributed during the year.

After having been laid aside for some time through pressure of work, the preparation of a complete list of all the maps and publications which have ever been issued by this branch has again been put in hand. It is hoped to have this completed in a short time.

From topographical maps prepared last year schemes of subdivision for the summer resorts at Clear lake in Riding Mountain forest reserve, and at Madge lake in Duck Mountains forest reserve No. 2 were laid out and instructions for the surveys issued. At Banff an extension was made to the subdivision in the villa-lot section in accordance with the design prepared by Mr. Mawson, the expert on town-planning. Plans of each of the seventeen blocks, on a scale of twenty feet to one inch, were made and from these all the information necessary for the execution of the survey was calculated. On the completion of the survey at Banff, the surveyor's returns were examined and a plan of the subdivision was compiled for publication. A plan was also prepared showing the topography of the south and west slopes of Tunnel mountain at Banff. The returns of the survey of the townsite of Woodhaven, on Bedwell bay, in fractional township west of township 39 west of the Coast meridian, were examined, and further instructions for this subdivision were prepared.

During the year four members of the staff of the division resigned and two were transferred to other branches. Three of these vacancies have been filled and it is expected that another will be filled shortly. This will bring the strength of the permanent staff to twenty-two which is two less than it was during the preceding year. In addition to this there are at present two temporary technical clerks.

## DIVISION OF EXAMINATION OF SURVEYS.

*(T. S. Nash, Chief of Division.)*

The work of this division comprises the returns of survey of Dominion lands in Manitoba, Saskatchewan, Alberta, the Yukon and Northwest Territories, and in British Columbia, excepting township subdivision in the Railway Belt.

In addition to examining the correctness of the returns, all the required official plans are also prepared in this division.

Surveyors in the field are required to submit, from time to time, sketches showing the progress of their work. These are examined to see that correct methods are being employed and that satisfactory results are being obtained; 100 progress sketches from inspectors, 285 from contractors and 1,027 from men employed by the day were examined.

The investigation and retraverse of lakes and former lake beds by stadia was continued by twelve surveyors, and has now become established as a part of the work.

Owing to the staff being shorthanded, and to the desirability of issuing the amended township plans with as little delay as possible, these stadia surveyors were again permitted to prepare from their field notes the amended township plans. Their field notes and the township plans have been checked by the regular staff; 103 field books and 697 plots comprised the final returns of stadia surveys in 541 townships.



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Including these stadia surveys, examination has been made of 310 subdivisions, 133 miscellaneous surveys and 563 township outlines. Memoranda on examination of returns were sent to the number of 349, and 325 replies were received and the necessary corrections made. The number of draft letters prepared was 2,254. Thirty contract accounts were prepared and closed as the work was shown by the inspectors' reports to be satisfactorily done. Compiled plans of 833 townships were completed, 248 of which were first edition plans. Compiled plans of 13 miscellaneous surveys and 11 settlements were also completed.

With regard to the Yukon Territory, sixty-two group lot surveys and seven base line and reference traverses were received and examined. Eighteen additional sheets of the Yukon map in the Stewart river district are almost completed.

Mineral claim surveys from the Beaver lake district in northern Saskatchewan have been dealt with to the number of forty-four, from Hudson bay thirty, and from other parts nine.

Inquiries from other branches of the department involved the writing of 324 memoranda, the preparation of 196 sketches and the calculation of 614 areas. The returns of seven timber berth surveys were examined and two timber berth plans prepared.

Plans of road diversions submitted by the provincial governments to the number of 541 have been examined and sent to be recorded. Of railways, eighty-five plans of right of way were examined, representing 3,045 miles of line. As two or more copies of many of these plans were submitted, the gross mileage of plans examined was 4,886.

The numerical strength of the staff which was formerly twenty-nine, is now reduced to twenty-four, of whom two have been on active military service since last August, and two have been absent on account of protracted illness.

#### DRAFTING AND PRINTING DIVISION.

*(C. Engler, Chief of Division.)*

#### *Township Plans.*

The preparation for printing of township plans constitutes the most important part of the work and takes up most of the time. During the year, 833 township plans have been prepared. Areas of lands patented are now omitted, so that as settlement proceeds the plans become simpler as regards areas shown. As the prepared copies after being photographed are filed for use in subsequent editions, and as we have now a large number of such copies, the work of preparing later editions is in many cases reduced; in others the changes required for the later editions are such as to call for complete new copies.

Closely connected with the preparation of plans of complete townships are occasional plans of small portions of them. These are asked for when it is desired to deal with a part of a township, and for some reason it is impossible to deal with the whole. An edition of such plans is not printed, but from four to six copies are made by hand.

The first plans of townships printed by the department were in colours to show topography. The editions of many of these have become exhausted, and it is necessary to reprint them. In some cases this has been done by simply photographing a print of the old edition, but where the colours do not permit of this being done the black portions of the plans are redrawn, photographed and printed, and the colours are then printed in the usual way.



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*Miscellaneous Surveys.*

Twenty plans of such surveys were prepared. They include settlements, town-sites, and subdivisions of which editions were printed, but do not include the occasional copies of plans made by hand for various purposes.

*Surveyors' Sketch Maps.*

In former years, our practice has been to print the sketch maps showing a surveyor's explorations for twelve miles on either side of base lines or meridians on a scale of six miles to an inch with an accompanying profile of the line on a vertical scale of 1,000 feet to an inch. The number of such maps has been increasing every year so that at last our facilities for printing them were greatly taxed; the cost of the paper was also a considerable item. It has therefore been decided to reduce the scales of these maps so that for the present issue they may be printed all on a single sheet, the horizontal scale being 12.5 miles to an inch and the vertical 2,000 feet to an inch. It may be remarked that while this reduction in scale saves printing and paper it increases the draughtsman's troubles as there is scarcely room for putting down legibly all the data to be shown. These maps are issued with the report of the branch.

*Miscellaneous Work.*

This department of the work is increasing every year and as each part of it requires individual treatment, the amount of time required is considerable. It includes fourteen plans to accompany Orders in Council, the mounting of seventy-six maps and the completing of 176 jobs of a miscellaneous character. The astronomical field tables have been rearranged and are now printed on three small folders instead of one as formerly.

## BRITISH COLUMBIA SURVEYS DIVISION.

(E. L. Rowan-Legg, Chief of Division.)

The work of this division consists of the preparation of preliminary plans from sketches sent in by surveyors, showing the progress of their work in the field, the examination of surveyors' field notes and plots, the compiling of township and other plans, the comparing of fair copies of township and other plans and replying to requests for various information.

The work done has been as follows: Preliminary plans compiled, 107, and copies made, 180; surveyors' field notes of subdivision surveys examined, thirty-two, and plots fifty-one; mineral claims, eight; field books of miscellaneous surveys, seven, and plans twenty-six; township plans compiled, seventy-two; miscellaneous plans compiled, ten; townsite plans compiled, one; fair copies of compiled plans compared, eighty-three; various plots and sketches made, 228; odd jobs and requests for various information dealt with, 677; draft letters and memoranda written, 608.

In June, 1914, the inspector of surveys in the Railway Belt, British Columbia, reported that the field book in use was inadequate, as it did not contain more than one-third of the notes taken in the field.

Specimen pages for a new book were prepared and sent to the surveyors for their opinions and for suggestions for the improvement of these pages.

The surveyors were unanimously of the opinion that the proposed books would be a distinct improvement on the old ones, and they offered some valuable suggestions, which were acted upon in the preparation of the new books.

To replace the old book, these new books have been prepared, one for final returns, one for field use, and one for the recording of astronomical and magnetic observations.



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The pages for field notes in the books for final returns and for field use are designed to contain the notes of either a section or a quarter-section boundary, and are ruled into squares to facilitate the recording of topographical features.

The opposite page is ruled to contain data for the calculation of horizontal and vertical distance.

Both books contain pages for calculation by latitudes and departures.

The book for field use contains blank pages interleaved for calculations appertaining to the field notes or the latitudes and departures. Waterproof detachable covers are provided with these books.

The book for recording astronomical and magnetic observations is made of pocket size, and contains ruled forms for entering observations for time and azimuth on the sun and stars and for variation of the compass needle.

Much time and thought were given to the preparation of these books so as to make them as complete and useful as possible.

The staff of this division has been reduced to four, one being absent on active military service.

#### SECTIONAL MAP DIVISION.

*(J. Smith, Chief of Division.)*

#### *Compiling Room.*

The compiling of new sectional maps and the revision of those already issued in order to keep them up-to-date, forms the chief work of this room. During the year, seven new sheets were compiled, and revised editions were prepared of fifty-five sheets. Plotting is done on a scale of two miles to one inch, and every effort is made to secure all available information.

The chief sources of information are the following:—

(1) Township plans, settlement plans, townsite plans, etc.; also field books and reports sent in by surveyors. Eight hundred and seven such were examined during the year.

(2) Railway location and construction plans on file with the Railway Commission. Eighty-seven plans were borrowed and used during the year. The working time-tables of the railroads were also searched for names and positions of stations.

(3) Until this year information relative to the positions of post-offices was furnished by the officials of the Post Office Department on cards supplied for the purpose. A new method is now being employed. When a sectional map is about to be revised a diagram is made out for each post-office and mailed direct to the postmaster with a request to check it over and make any corrections necessary. Considerable correspondence is involved, but the results are proving satisfactory. Four hundred and two of such cards and diagrams were received, and the information plotted.

(4) Seventy-nine plans and blue-prints of Indian reserves, forest reserves and Dominion parks were received and used in compilation.

(5) Road diversions are being constantly made by the provincial governments, and plans of these are filed with the Survey Records Branch. Four hundred and twenty-seven such plans were received and plotted.

(6) Valuable information was secured from sketch maps furnished by base-line surveyors and from maps and reports of the Geological Survey, Irrigation Branch, Chief Geographer's office, etc.; for sheets lying partly in British Columbia, maps published by the Government of that province were searched. Three hundred and sixty-eight of these miscellaneous maps, sketches and reports were utilized.

In addition to the work outlined above, this office compiles and edits the yearly pamphlets containing reports of surveyors. Reports received from surveyors from July 1, 1913, to July 1, 1914, were compiled and sent to print and have since been



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issued in five pamphlets, totalling 208 pages. Work was also begun on the pamphlets containing reports for the period from July 1, 1914, to March 31, 1915.

Since the initiation of the surveys of Dominion lands, surveyors have been required to make reports on townships covered by their surveys. In 1886 the reports received up to that time were issued in five pamphlets. From that date until 1903 the township reports were not issued at all. In 1903 they began to be printed as part of the annual report of the Topographical Surveys Branch, and since 1909 they have been published in yearly pamphlets.

It is proposed now to combine into volumes of convenient size all the township reports received to date, and it is estimated that twenty volumes of about 250 pages each will be required. The first of these, comprising all reports on townships east of the Principal meridian, has been compiled and sent to the printer; another is ready to send, and two others are in hand.

The work of examining the sketch maps sent in by base-line surveyors which was formerly done in another division of the branch was taken over by this division in November, and has since that time kept one man constantly employed. Thirty-four such sketch maps have been received and examined and compared with the surveyors' field notes. Tracings of these have also been made for blue-printing.

*Mapping Room.*

The usual work on the sectional maps has been continued.

Eight sheets have been reprinted without being revised, fifteen sheets have been revised and reprinted, and fourteen new sheets, covering an area of about fifty-one thousand square miles have been published.

A map of "Banff and vicinity," was also prepared and published on a scale of one mile to an inch; this map shows the Bow valley, and adjacent country from "The Gap" to Castle mountain.

A map defining the boundary between British Columbia and Alberta, on a scale of one mile to an inch, is being made but is not yet completed.

The permanent staff consists of eighteen clerks, an increase of two over that of last year.

## SPECIAL SURVEYS DIVISION.

(G. Blanchard Dodge, Chief of Division.)

*Base Line Surveys.*

The investigation of base lines and meridians for the purpose of locating and correcting errors of survey has been continued, and a surveyor has been employed in the field in retracing lines on which errors have been found to exist.

This work was begun in 1912 after it became known that some large errors existed among the older surveys in and around Manitoba, and the work has since been gradually extended to include all base lines and meridians so far surveyed. This work has been considerable, for in order to make the investigation of the bases and meridians complete many outlines in addition required to be examined, and the bases and meridians alone aggregate some 19,000 miles. For areas covered by recent surveys this work can be done with comparative rapidity, but among the older surveys, where measurements were not always accurate and entries in the surveyors' field notes often purely conventional, the work is multiplied many times.

On all the bases and meridians, complete returns of survey require to be examined, correspondence files read, theoretic as well as chained distances computed, bearings examined and deflections computed, corrections for elevation above sea-level and for latitude applied, block closings checked, results of latitude observations compared with the results of line surveys, widths of fractional ranges computed, chained lengths of bases between meridians compared with corresponding theoretic lengths, and finally the location, magnitude, direction and cause of any errors determined.



From the results of this work, sketch maps are in course of preparation showing the positions on the ground of all surveyed bases relatively to where they should be, and the differences in latitude between surveyed, theoretic, and sea-level values of each. In this way the framework of a system of control is being formulated which it is hoped will prove efficient.

Besides the investigation of base lines already run, this work includes also the draughting of technical instructions to surveyors making surveys of new bases and to surveyors making retracements of old lines for the purpose of locating or correcting errors.

#### *Astronomical Work.*

*Azimuth Observations.*—During the year the observations for the azimuth of base lines and meridians taken during the season 1913 and 1914 have been received and examined. The same high degree of accuracy found in the returns of the previous year is shown in these results. The errors existing in the bearing of the line are now very small, seldom more than 10", this being due to the frequency with which observations are taken, the accuracy of the observations, the care taken in applying the correction and the precision with which the line is run.

The new base-line transits are well adapted to the work. The horizontal circle is graduated every 5' and is read by two micrometer microscopes having a magnifying power of about 53. The micrometer head is divided into 60 equal parts, each division corresponding to 5" and the readings are estimated to seconds. The telescope is fitted with a micrometer eye-piece. As this eye-piece can be rotated in a plane perpendicular to the optical axis of the telescope, it may be conveniently used for measuring both horizontal and vertical small angles such as for azimuth observations when running a meridian, the telemetric measurement of distances and for latitude observations by Talcott's method. Azimuth observations are generally taken in daylight, but for latitude or other work desired at night the instrument is fitted with a complete system of electric illumination. A full description of the instrument is in course of preparation, and will be published in monograph form.

*Latitude Observations.*—Checks on the positions of base lines in the district between lake Athabaska and British Columbia were required, and a surveyor took observations for latitude with the zenith telescope at four points therein. The results of these observations when checked and the necessary computations made, were found to be satisfactory. No large errors were found to exist in the latitudes of the bases.

*Astronomical Field Tables.*—The astronomical field tables for the year have been prepared and issued. The field tables were first issued in 1903, when they were made out for periods of six successive months; they were set up in type and printed on a single sheet of strong paper, fifteen by six inches, folding to three by six inches for the pocket, and contained a table for finding the pole star and the astronomical meridian, a list of time stars, a table of the sun's apparent right ascension, a small map showing approximate magnetic bearings of astronomical north in western Canada, and diagram showing at a glance the latitude, longitude, and convergence of meridians for any point of the system up to township 80. It was then thought that the field tables would greatly simplify the taking of astronomical observations for azimuth. They were greatly appreciated by surveyors and were soon found to make possible a distinct increase in the accuracy of subdivision surveys. They are now of such service to surveyors as to be considered indispensable. Numerous changes have been made since their first appearance however. Each set of tables for the azimuth of Polaris is now made to cover either two periods of three consecutive months or three periods of two consecutive months in successive years. The reason for this is that the position of Polaris for a given period in one year is approximately the same as its position for a different period in the preceding or following year, so that by a judicious combination of months in different years a great increase in the accuracy of the tables is obtained.



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The gradual northward advance of settlement, which of course must be preceded by the surveyors, has necessitated the tables and diagrams being extended as far north as township 140, and the better class of instruments now used has made desirable the addition of many stars of the second and third magnitude to the list of time stars.

Delay in issuing the tables is avoided by having prepared special printed forms on which the variable matter of the tables is stamped as soon as obtained from the computing office, and the finished table is then reduced and printed by photo-zincography.

As explained in last year's report, it is now necessary to issue the field tables in two sets, one set giving data for the reduction of stellar observations, and the other giving data for solar observations. Each is printed on sheets of strong paper, sixteen by six inches, folding to pocket size of four by six inches.

The diagrammatic map giving the astronomical bearings of magnetic north in western Canada is now omitted from the field tables. It was necessarily of a very rough and approximate nature, as until recently very little information has been available on this subject. The large amount of data respecting magnetic declination at points in the western provinces, which have been obtained from surveyors in recent years, has made possible a much more accurate representation of the isogonic lines over western Canada. A map has been compiled on a much larger scale than the former one, showing the results of this magnetic work. It is printed on stiff cardboard of convenient pocket size.

The extension of the tables for the azimuth of Polaris, and the peculiar effects which the phenomena of precession and nutation have upon the apparent motion of Polaris, have made necessary an investigation into the accuracy of the tables as they are now presented, and the advisability of increasing their accuracy by some radical change in the form of the tables. This has been done during the year. The maximum error of the tables for township 140 exceeds half a minute on only a few days of the year, and for but a few hours on each of these days. At all other times the error is well under half a minute. The errors for the more southern townships are less than for township 140; thus, the errors of the tabulated figures for township 80 rarely approach and never exceed half a minute of arc, while those for townships farther south are still less. This gives a sufficient accuracy for ordinary subdivision and traverse work, and it was therefore decided that no change in the field tables is yet required. It has also been shown that any desired increase in the accuracy of the tables could only be obtained by adopting a much less convenient arrangement than the present one, or by greatly increasing the frequency with which the tables are issued, with a consequent increase in the computing. Some such change may become necessary in the future.

*Magnetic Survey.*

Fifty surveyors were instructed to observe for magnetic declination and during the miscellaneous surveys made by R. C. Purser, D.L.S., observations for magnetic dip and total force were taken at twelve stations. The results are given in Appendix 62.

During the season of 1913, R. C. Purser, D.L.S., and G. A. Bennett, D.L.S., were both engaged in taking observations for magnetic dip and total force, but this season owing to the nature of his work, Mr. Bennett was not available. This accounts for the smaller number of observations taken this year.

Every observation for magnetic dip and total force consisted of a dip, a total force, and a dip, the mean dip being used in working out the total force. This complete observation was duplicated at every station, and the average range found to be comparatively small. The instrument used was a Dover dip circle, the total force constant of which was determined both at the beginning and end of the survey season. This constant was the mean of at least six observations, and the probable error in each case was less than .0001 c.g.s.



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The index correction to the compass of every transit used for observing was determined both at the beginning and end of the survey season. If a serious discrepancy was found between the two determinations, it was investigated, and unless the discrepancy could be satisfactorily explained, the observations taken with the instrument were rejected. Every observation for magnetic declination has been checked and plotted on a large-scale map. They also have been reduced to the mean of the month in which they were taken, by means of the daily records of the declino-meter at Agincourt, except those that were taken at times when the records were not observed. In the appendix, those observations that are not reduced to the mean of the month are marked by an asterisk.

Returns of magnetic declination received to date for 1914.....	1,439
Previous returns since 1908.....	5,414
Total returns to date.....	6,853
Dip observations received for 1914.....	62
Previous returns since 1908.....	289
Total force observations for 1914.....	46
Previous returns since 1908.....	214

### *Surveying Instruments.*

The instrumental equipment of the surveyors employed in the field was inspected during the year, and those whose equipment was not satisfactory were required to provide themselves with approved instruments.

Repairs were made to fifty-five transit theodolites, twenty-seven dumpy levels, twelve surveying aneroids, one zenith telescope, six rod levels, nine cameras, two stadia rods, three precise levelling rods, and three clinometers.

Thirty-three sidereal watches and one box chronometer were overhauled and readjusted.

The surveying instruments shipped during the year comprised 285 packages weighing 15,126 pounds, while 225 packages weighing 12,732 pounds were received.

A statement of the surveying instruments on hand on March 31, 1915, showing also the instruments purchased and sold during the year, is given in Appendix 64.

### *Surveys Laboratory.*

The regular work of the Surveys Laboratory during the past year has included complete tests of one block survey transit, forty-two D.L.S. subdivision transits, one alidade, and six levels. Partial tests were made of one block survey transit and twenty-eight D.L.S. subdivision transits. The index corrections of nineteen aneroids, the value per turn of five microscope screws, the linear distance between cross hairs of four extra diaphragms, and two level values were determined. Besides the above, thirty-eight sidereal watches have been submitted for trial.

For the past two years a number of parties have been engaged in the field in making traverses of lakes. The stadia has been found to be the most rapid and convenient method of doing this work, and has been used exclusively. The stadia constants of each instrument used are determined at the Surveys Laboratory, and stadia correction tables were computed and printed for the use of the surveyors in the field. Fifty-one such cards in all were printed.

In connection with the testing and rating of the watches and laboratory time pieces, twenty-seven time observations were taken.

Of the thirty-eight watches tested, twenty-six were new and twelve had been previously tested, rejected, and returned to the makers for readjustment. There were fifteen watches which passed the test, seven of them being new and eight old, i.e., thirty-nine per cent passed as against fifty-seven per cent in 1914.

The results of the trials of the fifteen watches which passed are given in Appendix 63.



## SESSIONAL PAPER No. 25b

The watches tested and supplied to surveyors are cheap ones, costing only \$45. Better watches are not procured because it is inevitable that in the course of a surveyor's operations the watch may be submitted to extreme cold, and the finer watches would become no better than the cheaper ones. The conditions of the test were given in our report of last year. All watches which are successful in passing the "Standard of Test" are given marks for isochronism, position, adjustment, and temperature compensation as follows:—

With the theoretically perfect watch  $\alpha$  would be = 0 and would get 400 mks.  
 $\beta$  " = 0 " " 400 "  
 $\gamma$  " = 0 " " 200 "

A watch which had just succeeded in passing the "Standard of Test" would have:—

= 0.75 and would get 0 marks.  
 = 3.5 " " 0 "  
 = 0.3 " " 0 "

Denoting by X, Y, Z, the corresponding numbers merited by the watch

$$\begin{aligned} X &= \frac{1600}{3} (0.75 - \alpha) \\ Y &= \frac{800}{2} (3.50 - \beta) \\ Z &= \frac{2000}{2} (0.30 - \gamma) \end{aligned}$$

and the total marks for the watch:—

$$S = X + Y + Z.$$

For the fifteen watches which passed, the average errors for isochronism were as follows:—

P.U.	P.R.	P.L.	D.U.	D.U.	D.U.	D.D.	P.U.
			40°	65°	90°		
0°.54	0°.53	0°.54	0°.65	0°.53	0°.52	0°.41	0°.54

The smallest error for  $\alpha$  was 0°.41.

The average errors for position were:—

P.U.	P.R.	P.L.	D.U.	D.D.
1°.53	2°.68	3°.02	1°.43	1°.49

The smallest error for  $\beta$  was 1°.23.

The average temperature coefficient was 0s.08, two watches have coefficients of only 0s.02.

Comparing the average errors of the watches which passed with those for 1913 and 1914, we have the following:—

	1913.	1914.	191 .
Average error for isochronism.....	0°.59	0°.45	0°.53
" " position.....	2°.58	2°.03	1°.89
" " compensation.....	0°.14	0°.10	0°.08

As noted in 1914, the lowest average error in isochronism for both the watches which passed the test and those which failed was in the D.D. position. The largest average error in isochronism is for those which passed, as in 1914, in the P.U. position, but for those which failed, the largest error is in the P.R. position. In position, the largest average both for those which passed and those which failed is in the P.L.



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position. Of the twenty-three watches which failed: four, or seventeen per cent, failed in isochronism; fourteen, or sixty-one per cent in position; and five, or twenty-two per cent, in both isochronism and position. All passed the test for temperature compensation.

At the Comparator building, the lengths and weights of ninety-four tapes of all kinds, and two invar wires were determined. Fifty-eight intercomparisons of the laboratory standards were made, and two precise levelling rods were tested.

The comparator base was verified twenty-five times by the standard four-metre rule. The first verification was made in September, and they have been made at regular intervals of time since. They appear to show a regular long period change in the length of the base. When a longer interval of time has elapsed we will be in a better position to make a study of this change.

The work of improving the apparatus has been carried forward as far as time would permit. At the Surveys Laboratory besides minor improvements, an air pump of the water-jet type has just been installed whereby reduced pressures may be maintained for extended periods in the air receiver. This apparatus will enable a more thorough examination of the behaviour of aneroid barometers to be made than has been hitherto possible.

When the Comparator building was erected, the intention was to heat it by gas. This has been tried but has not proved a success. The fumes from the gas affected the apparatus and made the room very trying to work in. It was decided therefore to try electric heating. The full system consists of heaters and automatic control. At the present time, we have only the heaters. But even this is a great improvement, and has given good satisfaction. With care the building is capable of quite close regulation, and the daily temperature of the test room may be controlled within a small range. Tests can now be carried on at a practically uniform temperature very close to 62° Fahrenheit except during the extreme summer weather. We hope later to be able to install the automatic control, when still better results are expected. The cost of the electric heating has proved to be not any greater than that by gas. Between tests in the warm weather the ventilators and air intakes are closed during the day, and opened at night, when a current of cool air is forced through the building by means of blower fans. The extremely well insulated walls and ceiling usually prevent any excessive rise in temperature during the daytime.

The apparatus installed in the Comparator building, for the testing of measures of length, will be fully described elsewhere. In addition to the regular tests, some important experimental work has been done. The object of this was to investigate the characteristics of the apparatus, and the degree of precision which might be expected from it. That part of the work referring to the comparator base is not yet complete, but some interesting results have already been attained on the secondary apparatus. These go to show that this is capable of giving results beyond our best hopes and of a degree of accuracy far greater than that needed for most practical purposes.

In comparing tapes directly with the bench-marks, many precautions are entailed, and it was decided therefore that a secondary apparatus should be constructed so that surveying tapes might be quickly and accurately compared with the laboratory standards, which in turn are periodically referred to the bench-marks. Briefly, this apparatus consists of a series of pulleys, mounted in pairs, so that the two tapes are supported independently. At the ends are grooved pulleys supporting the wires imparting tension to the tapes, the tension being applied by means of weights. Micrometer microscopes at the two ends of the tape are used in making comparisons. The zeros of the tape and standard are brought into coincidence under one microscope, and readings are taken with the other. The supporting pulleys are spaced one hundred inches apart. With this spacing, the effect of differential sag may be neglected when the weights of the tapes agree within certain ordinary amounts. But the increased



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friction due to the introduction of a large number of pulleys may prove to be a source of error sufficient to more than offset any errors that may arise from an erroneous correction for differential sag. If the apparatus is to be efficient, the friction must be reduced to a minimum. This point was kept in view during the design and construction of the apparatus. How successful was the result may be gauged from the tests which follow and also from the fact that it was found necessary to apply the tension weights at but one end, otherwise the tapes would not maintain their relative position for the short space of time required to take readings. As in use at present, the zero end of the standard is attached to a fixed point and that of the tapes to a slider having a fine longitudinal screw adjustment. The pulleys are of the lightest possible design consistent with the necessary strength and were carefully machined. They are mounted on ball bearings, also accurately made and adjusted.

The object of the experiments described below was to find out the amount by which the friction in the apparatus would affect the results obtained in the standardization of tapes.

The first test consisted in finding the force necessary to overcome friction in the apparatus. This was first done with the tape hanging in a single catenary, so that only the two grooved tension pulleys were involved, and then a similar test was made with the addition that the tape was supported along the intermediate pulleys. A sixty-six-foot steel tape was used in these tests, which were carried out with both a wire and a cord passed over the tension pulley. The pulleys were set in four positions 90° apart, and weights were added at one end until the tape began to move. The experiment was then repeated with every condition the same save that weights were added at the other end.

The following shows the results:—

*Friction Test.*—To determine the amount of friction in secondary apparatus.

**Tape:** Steel tape, sixty-six feet under tension of ten pounds. (Cord connection.)

Average weight added for four positions of pulleys:—

End Pulleys only—

Weight added at pulley A. . . . .	0.019 pounds.
“ “ “ C. . . . .	0.011 “
Mean for two ends. . . . .	0.015 “
Friction for one pulley only=0.008 pounds.	

End Pulleys and nine intermediate pulleys—

Weight added at pulley A. . . . .	0.023 pounds.
“ “ “ C. . . . .	0.016 “
Mean for two ends. . . . .	0.020 “
(Friction for two end pulleys and nine intermediate pulleys.)	

Alteration in tension due to one end pulley, and nine intermediate pulleys, 0.012 pounds. (Working conditions.)

These results were obtained on the inner set of pulleys, used to support the standard. A similar determination for the outer set gave a value of 0.015 pounds for one end and nine intermediate pulleys. Using wire connections instead of cord for the tension weights, values of 0.014 pounds were obtained for each set.

This amount is seen to be very small. The correction to be applied from this source of error in testing a sixty-six-foot tape under the above conditions would amount to but approximately 1 in 10,000,000.

The test, though satisfactory from this point of view, gives no direct indication of the effect of friction on the determination of the length of a tape, and therefore a second series of experiments was made in order to detect, if possible, the exact amount by which readings are affected by friction in the apparatus. The tape and



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standard were suspended on intermediate pulleys exactly as when making a regular test, and readings were taken first by bringing the zeros into coincidence from left to right and then in the opposite direction. When moved towards the zero by means of the adjusting screw, the tension at the zero end will be the sum of the weight and the friction in the pulleys; if the tape is moved in the other direction the tension at the zero end will be the difference of these. This difference in tension, if large enough to affect the readings, would cause the tape to show longer when moved towards the zero end than when moved in the opposite direction.

Tests were made on a sixty-six-foot tape, under tensions of ten pounds and ten kgs., and with a 100-foot tape under similar tensions. The two observers each made five settings and then changed places, so that, as far as possible, personal equations were eliminated. Three complete determinations were made under each of the above conditions; a typical example is recorded as follows:—

*Friction Test.*—To determine influence of friction on comparisons made with Secondary Apparatus:—

Steel tape, 100' T S 863. Compared with T S 805 (laboratory standard tape.)

Tension=ten pounds.

Settings toward Zero—Microscope readings.			Settings from Zero—Microscope readings.		
Standard.	(Obs.—W. G. H.)	Tape.	Standard.	(Obs.—W. G. H.)	Tape.
7 797 <sup>mm</sup>		8 529 <sup>mm</sup>	7 785 <sup>mm</sup>		8 503 <sup>mm</sup>
795		527	785		511
796		531	784		511
794		533	785		512
797		535	788		512
	(Obs.—W. J. L.)			(Obs.—W. J. L.)	
7 805		8 522	7 805		8 520
806		529	803		525
801		525	803		529
808		530	802		528
810		529	805		526
Average value, tape longer than standard by 0.728 <sup>mm</sup> .			Average value, tape longer than standard by 0.724 <sup>mm</sup> .		

Tape apparently .004<sup>mm</sup> longer when brought towards zero.



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The following is a summary of all the tests:—

*Friction Test.*—To determine influence of friction on readings obtained with Secondary Apparatus:—

Conditions.	Variation of tape from standard.		Difference.
	To zero.	From zero.	
	mm	mm	mm
66' steel tape. Tension=10 lbs.....	0.145	0.138	0.007
	0.148	0.140	0.008
	0.170	0.168	0.002
66' steel tape. Tension=10 kgs.....	3.125	3.115	0.010
	3.120	3.114	0.006
	3.122	3.112	0.010
100' steel tape. Tension=10 lbs.....	0.728	0.724	0.004
	0.729	0.727	0.002
	0.731	0.726	0.005
100' steel tape. Tension=10 kgs.....	0.096	0.080	0.016
	0.099	0.085	0.014
	0.101	0.092	0.009

Although it appears possible to detect the effect of friction in the above, yet this is very small. In the example completely recorded, which shows the usual variation in a set of individual readings, the tape is apparently longer by .004<sup>mm</sup> when brought towards the zero. This is double the friction error and would cause an apparent error in the length of the tape of about 1 in 15,000,000. The various other tests give a maximum error of approximately 1 in 4,000,000.

The results tend to show that the friction is extremely small, and the slight influence on readings is within the degree of accuracy which is desired for any comparison on the secondary apparatus.

### *Correspondence.*

The number of draft letters prepared was 1,612. Sixty-four letters of instruction to surveyors were prepared, and 454 memoranda written.

PHOTOLITHOGRAPHIC OFFICE.

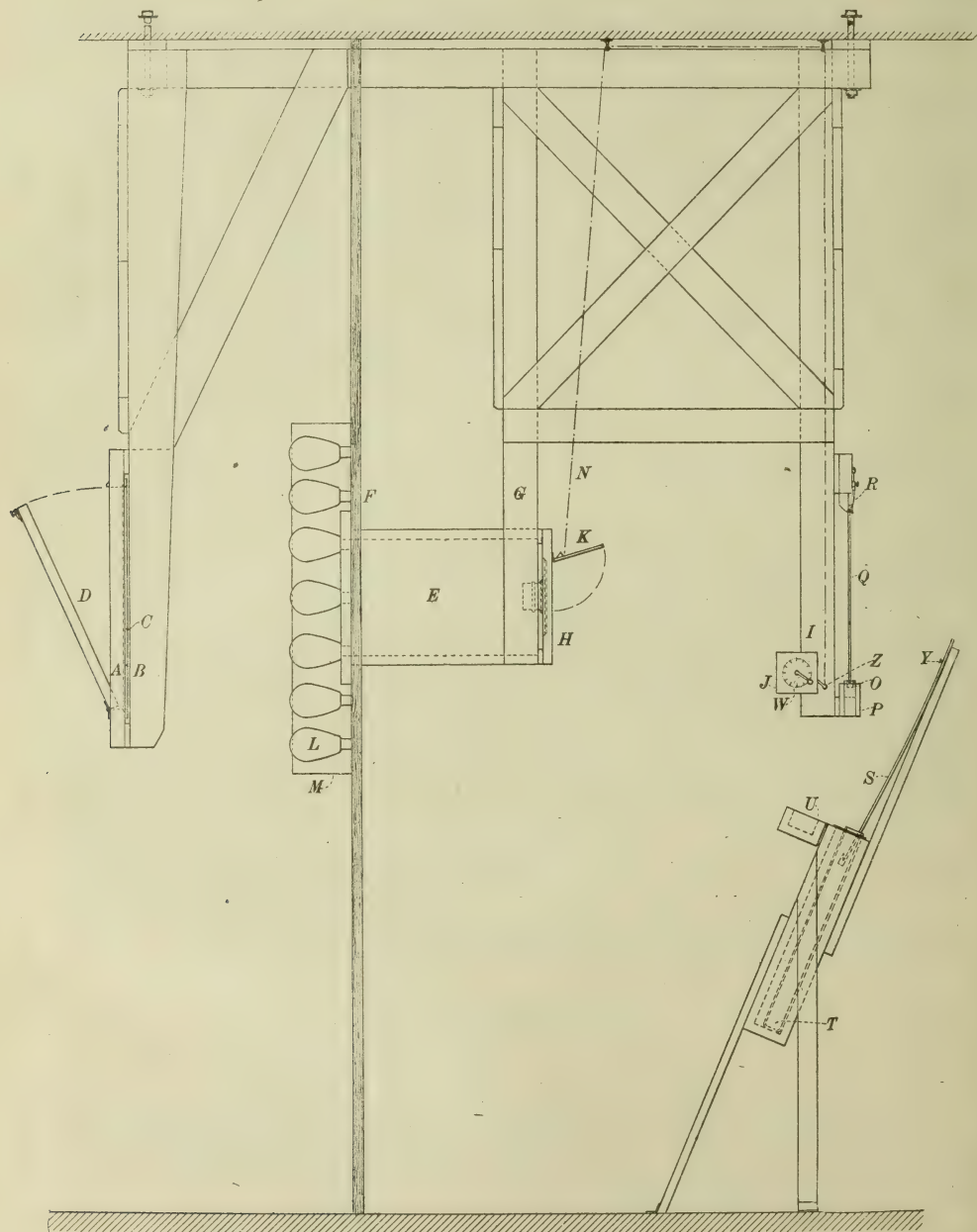
(H. K. Carruthers, Process Photographer.)

The work of this office has increased so much that it was necessary to install a second copying camera, and as the townships, which are of a standard size and reduction, comprise most of the work, it was decided to make it a fixed focus camera to take care of this particular work.



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A space in one corner of the room seven feet by thirteen feet was partitioned off and the camera hung partly in and partly out of this room.



This cut shows a vertical section of the apparatus, and is as follows:—

On the ceiling is bolted a heavy pine frame from which project the arms B, G, and I.



## SESSIONAL PAPER No. 25b

On the arms B, which are outside the partition F, is fastened the copyholder A. This holder has a plate glass C fastened to the inside face, and against this glass the copy is held by the pressure from the hinged panel D.

The lens box E is screwed to the partition F, and on both sides of this box-opening is arranged fourteen 110-volt 200-watt high efficiency Tungsten lamps L with two reflecting mirrors M.

The arms G carry the lens board H and, to avoid vibration, hang free of the lens box.

As the exposure is made in the dark-room, a plate holder is unnecessary.

A glass plate is coated with collodion and placed on the ebonite dipper S, then lowered into the silver bath T. The hinged lid U is turned over into place to exclude light and dust.

After sensitizing is completed, which requires about four minutes' immersion, the plate is drawn up and the dipper S hung on hook Y to permit of the excess silver draining back into the bath. Before raising the plate the room is darkened, sufficient light coming through a large ruby glass window.

The plate is now taken off the dipper and placed in position for exposure.

On the arms I are wooden blocks P which are cut out to receive the ebonite plate-rest O. On this plate-rest the sensitized plate Q is laid and held firmly in position by the sliding catch R.

Directly behind the plate within arms' reach is the switch which controls the lamps L.

The exposure is timed by a Warwick meter J. The hand W being set, all that remains is to pull down the lever Z. This pulls the cord N and raises the lens cap K. When the hand W travels back to zero the lever Z is automatically released, closing the lens cap K.

The regular procedure is followed in developing and fixing the plate.

The developing trays and sink, being about three feet from the camera, considerable walking is saved, and the negatives are made more expeditiously.

A new marble switchboard with ammeter and rheostats was installed, adding materially to the safety and convenience of the numerous arc and other lamps, mercury tubes, etc., used in the office.

Hill work on the three-mile sectional maps which is in black on the old manuscripts, is now printed in brown. To avoid redrawing the sheets, the hills are stopped out on the negative by the retouchers.

The hill work is drawn separately on tracing linen by the draughting division in exact register with the black.

During the year a retoucher was added to the staff, bringing the total number up to eight, of whom one is absent on active military duty. A schedule of the work for the year is given in Appendix No. 6.

## PHOTOGRAPHIC OFFICE.

(J. Woodruff, Chief Photographer.)

The output of the photographic office shows a decrease as compared with last year. This is principally in the smaller sizes of velox prints and negatives, large numbers of which were formerly printed and developed for other branches of the service. This work had to be discontinued owing to the increasing size of and the longer time demanded by our own work, so that although the number of items is less than last year, the amount of work done is really greater.

In Vandyke and blue-print work only such sizes as can be conveniently handled in the limited space at our disposal are now done here, the very large tracings being sent to the Railway Lands Branch, where special equipment is available for doing such work.



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On the fixed focus enlarging camera, nearly 2,000 enlargements were made. This camera is used only for enlarging from topographical survey negatives. These are enlarged to a standard size of ten by fourteen inches on bromide paper, and the prints are used in plotting the survey.

This camera, which has been in use for many years, has been entirely remodelled in preparation for next season's work. The method of illuminating the negative has been changed. Four powerful nitrogen-filled Tungsten lamps are now used, and this together with a new lens has much improved the definition of the enlarged image. A new negative holder has also been added, which is unique in construction and a big improvement on the old one.

The changes will facilitate the working of the camera as well as improve the quality of the work.

The new enlarging camera which was installed last year, and of which a description was given in the report, has proved most satisfactory and is a great help in getting out the work of the office promptly.

The staff remains the same as last year, viz., one photographer and four assistants. A schedule of the year's work accompanies this report.

#### LITHOGRAPHIC OFFICE.

(A. Moody, Foreman).

Appendix No. 8 shows an increase of output over last year, the monthly average of plans printed being over 111, and the number of copies over 35,000. Many of these plans were printed in several colours, making the number of runs on the two power presses about 70,000. This is by no means a large run for two presses, but as the number of copies from each map or plan is small a considerable amount of time is spent in changing from one plate to another and again from one colour to another.

In addition to the regular work of this office, maps and plans have been printed for several other branches of the department, including maps of forest reserves for the Forestry Branch, plans to accompany Orders in Council for the Ordnance Lands Branch, and maps for the International Waterways Commission.

The printing of sectional maps on the three-mile scale in colours is being gradually carried out. For a time they were printed in black with a tint of blue for water areas. The next step was to print hills in brown and still later a green was added for forest reserves. These colours add greatly to the appearance and to the clearness of the maps, as well as to the work of the printers, the plates for all flat tints having to be made by them. The same is true also of the reprinting of plans of townships formerly issued in colours; here again all the colours, i.e., all the work except the black is done by the printers.

Owing to increase of work generally an additional transferrer was engaged.

#### GEOGRAPHIC NOMENCLATURE.

Mr. Witcher, who has charge of this branch of work in the department, reports the usual examination of all the sketch maps, compiled township plans, sectional, and other maps, surveyors' reports, etc., and has also continued to act as a member and secretary of the Geographic Board of Canada. The annual report of the board, which is still published as a supplement to the annual report of this department, is now closed at the expiration of the fiscal year, instead of the former date, June 30, and includes all decisions rendered during the year, which had been previously published in *The Canada Gazette* and in bulletin form. The report was printed in English and French and largely distributed to Dominion and provincial officials, geographical societies, colleges and schools.



## SESSIONAL PAPER No. 25b

## BOARD OF EXAMINERS FOR DOMINION LAND SURVEYORS.

(J. Aurele Cote, Secretary.)

The Board of Examiners for Dominion Land Surveyors held three meetings during the year. The first was a special meeting lasting from April 28 to June 4 (inclusive), 1914, during which examinations were held at Ottawa, Toronto, Winnipeg, Regina, Calgary, and Edmonton. The second was another special meeting which took place on September 23, 1914. The third was the regular annual meeting called for by section 9 of the Dominion Lands Surveys Act. It began on Monday, February 8, 1915, and lasted until March 26, 1915. During this meeting examinations were held at Ottawa, Kingston, Montreal, Toronto, Winnipeg, Calgary, Edmonton, and Dawson. The total number of candidates for examination was 280. Of these, 201 tried the preliminary examination, seventy-three tried the final examination, and six tried the examination for Dominion Topographical Surveyor.

Twenty-eight candidates were successful at the preliminary examination as follows:—

*Preliminary Examination.*

Alberga, George Frederick, Montreal, Que.	Hogarty, Bertrand B., Winnipeg Man.
Bradley, Nicholas Hilburn, Calgary, Alta.	Jones, J. Donovan, Amherst, N.S.
Brown, Leo. B., Holden, Alta.	McKittrick, Ernest S., Edmonton, Alta.
Burchnall, Ralph Parker, Calgary, Alta.	Meikle, MacKay, Ottawa, Ont.
Burn, George Augustus Harold, Janetville, Ont.	Murphy, Charles Homan, Edmonton, Alta.
Bysshe, Gordon Thomas, Ottawa, Ont.	Nesbitt, Francis Grey, Sherbrooke, Que.
Cormack, Alexander, Edmonton, Alta.	O'Brien, J. Edwin, Toronto, Ont.
Cox, Arthur George, Ottawa, Ont.	Orr, William S., Cobourg, Ont.
Caughlan, John Q., Chipman, Alta.	Pringle, John Earle, Hamilton Ont.
Crain, G. E., Ottawa, Ont.	Racknow, Ernest, Princeton, Ont.
Duncan, Stuart MacPherson, Ottawa, Ont.	Scott, Russell George, Toronto, Ont.
Fraser, Andrew Stockwell, Ottawa, Ont.	Somerville, William Johnston, Ottawa, Ont.
Greig, Joseph W., Kingston, Ont.	Throop, Wilfred Earle, Brockville, Ont.
Hemmerich, George, Conestogo, Ont.	Walcot, John Bevan, Montreal, Que.

Forty-two candidates were successful at the final examination as follows:—

*Final Examination.*

Alexander, John Bentley, Vancouver, B.C.	Hardonin, Joseph, Calgary, Alta.
Beatty, Frank Weldon, Pembroke, Ont.	Harper, Clarence Johnston, Orangeville, Ont.
Beatty, William Benjamin, Sarnia, Ont.	Hellferth, John Benedictus, Toronto, Ont.
Benner, James King, Alvinston, Ont.	Hotchkiss, Cyrus Percival, Edmonton, Alta.
Beresford, Herbert Graham, Winnipeg, Man.	Kinnear, Louis Arthur, Port Colborne, Ont.
Browne, Ernest Frank, Ottawa, Ont.	Leitch, John Strickland, Calgary, Alta.
Brown, Lindsay Osborne, Ottawa, Ont.	Lumb, William Ewart, Fort Stewart, Ont.
Brown, Milton, Kitscoty, Alta.	MacLeod, David Douglas, Park Hill, Ont.
Carson, John Alton, Vancouver, B.C.	McCloskey, Michael D'Arcy, Chelsea, Que.
Child, Cyril George, Calgary, Alta.	McKusker, Knox Freeman, St. Louis de Gonzague, Que.
Coltham, James Thomas, Aurora, Ont.	Meikle, Angus Urquhart, Kingston, Ont.
Crowther, Keston Nelson, Qu'Appelle, Sask.	Melrose, Thomas Montague, Coaticook, Que.
Crouch, Milton Edwin, Toronto, Ont.	Moran, Patrick Joseph, Kingston, Ont.
Doze, Joseph Wilbert, Fort Saskatchewan, Alta.	Perron, Hermel Marie, Edmonton, Alta.
Draper, Walter Harold, Edmonton, Alta.	Robinson, William Earl, Columbus, Ont.
Duffield, Hugh J., Calgary, Alta.	Scott, Buckton Arthur, Essex, England.
Ewing, Ernest Oilphant, Toronto, Ont.	Shaver, Peter Albert, Calgary Alta.
Finnie, Oswald Sterling, Ottawa, Ont.	Smith, Neville Herbert, Ottawa, Ont.
Gass, Lawrence Henderson, Iroquois, Ont.	Venney, Leonard Thomas, Brockville, Ont.
Gibson Morton Milne, Willowdale, Ont.	Zinkan, William Edward, Southampton, Ont.
Gorman, Arthur Oswald, Buckingham, Que.	
Gourley, Robert Murray, North Bay, Ont.	

The time of the board, during the meetings, was largely taken up with the reading and valuation of the candidates' answer-papers. Complete sets of question papers,



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to be used at the next examination were also prepared. In addition to this, the evidence submitted by candidates at the final examination, in proof of their eligibility therefor, had to be examined. This evidence consisted of certificates of provincial land surveyors and of affidavits of service under articles or apprenticeship.

Four candidates, who presented themselves for final examination, had not quite completed their time under articles. They were admitted on the understanding that, in case they were successful, their commissions would not issue until they had completed their apprenticeship and furnished affidavits in the regular form.

The board had to consider several applications which were received from college and university graduates asking to be admitted to the privileges of section 22 of the Surveys Act which provides for a shorter term of service under articles.

The Board of Examiners, wishing to facilitate in every way the enlistment for active service of articulated pupils, gave the following decision at one of its meetings: "That in all cases where a candidate is articulated to a Dominion land surveyor, time spent on active military duty would count as office time under articles to a Dominion land surveyor, but not as field time."

During the year a new edition of the "Rules and Regulations of the Board" was published. This edition is known as the "Ninth Edition," and contains several amendments to the former publication. Previously, marks were allotted to the various subjects in the order of importance, while now one hundred marks are allotted to each subject. This arrangement facilitates greatly the marking of the papers.

Forty-one commissions were issued to candidates who had passed the final examination, and had furnished oaths of office and allegiance and bonds for the sum of one thousand dollars, as required by section 25 of the Dominion Lands Surveys Act.

Thirty-one certificates of preliminary examination were issued to successful candidates who had complied with the requirements of the law.

Section 35 of the Dominion Lands Surveys Act provides that every Dominion land surveyor shall be in possession of a subsidiary standard of length. Fifteen new standards were issued to surveyors during the year. A list of Dominion land surveyors who are in possession of standard measures will be found in Appendix No. 9. A communication was received from the secretary of the Ontario Land Surveyors' Association pointing out that the O.L.S. standard measure was in every way similar to the D.L.S. standard, and asking that any Ontario land surveyor who becomes a Dominion land surveyor should not be required to procure a new standard. He was informed that there was no objection to his request, provided the standard was in good condition and was tested under the supervision of the Surveyor General at Ottawa.

Mr. F. D. Henderson, who had been secretary of the board since 1906, resigned his office during the year, and Mr. J. Aurele Cote, of the Topographical Surveys Branch, Interior Department, was appointed to the position in July, 1914.

The correspondence of the board was as follows: Letters received, 1,621; letters sent, 914; circular letters, pamphlets and parcels sent, 1,547.

#### APPENDICES.

No. 1. Schedule of surveyors employed and work executed by them.

No. 2. Schedule showing for each surveyor employed the number of miles surveyed, of township section line, township outline, traverses of lakes and rivers, and resurvey; also the cost of the same.

No. 3. Surveys in the Yukon territory returns of which have been received during the year.

No. 4. Details of the office work.

No. 5. Sectional maps of which new editions have been issued.

No. 6. Work executed in the photographic office.



## SESSIONAL PAPER No. 25b

No. 7. Work executed in the lithographic office.

No. 8. Office staff of the Topographical Surveys Branch at Ottawa, as on April 1, 1915, with the name, classification, duties of office, and salary of each.

No. 9. List of Dominion Land Surveyors who are in possession of standard measures.

Nos. 10 to 61. Abstracts of reports of surveyors employed.

No. 62. Results of magnetic observations.

No. 63. Results of watch trials.

No. 64. List of surveying instruments on hand on March 31, 1915.

## MAPS AND PROFILES.

The following maps and profiles accompany this report:—

Map showing surveys to March 31, 1915.

Maps to accompany reports of surveyors.

Profiles of meridians and base lines.

I have the honour to be, sir,

Your obedient servant,

E. DEVILLE,

*Surveyor General.*







# TOPOGRAPHICAL SURVEYS BRANCH

## SCHEDULES AND STATEMENTS

### APPENDIX No. 1.

SCHEDULE of Surveyors employed and work executed by them from April 1, 1914, to March 31, 1915.

Surveyor.	Address.	Description of Work.
Akins, J. R. . . . .	Ottawa, Ont. . . . .	Survey of the 29th base line across ranges 2 to 24, west of the Fifth meridian.
Aylsworth, C. F. . . . .	Madoc, Ont. . . . .	Resurvey in tp. 22-3-Pr., tp. 23-5-Pr., tp. 12-10-E., and tp. 14-11-E. Traverse in tp. 20-4-Pr.
Baker, M. H. . . . .	Toronto, Ont. . . . .	Subdivision in tps. 12 and 16-1-4, tps. 14 and 15-5-4, tp. 17-6-4, tp. 21-8-4, tp. 20-9-4, and tp. 19-7-5. Retracement in tps. 14 and 15-5-4, tp. 20-9-4, tp. 5-14-4, and tp. 16-4-5. Resurvey in tp. 13-24-3, and tp. 9-12-4. Correction survey in tp. 23-29-3, and tp. 41-14-4. Traverse in tps. 1 and 20-4-4. Survey of lot in secs. 7 and 8, tp. 28-18-5. Restoration survey of the cemetery at Field. Traverse of roads from Field to Hector, from Field to Ottertail, from Field out the Yoho valley, and from Lake Louise station to Chateau Lake Louise. Posting of part of the townsite of Wymark. Retracement of coal claims along Sheep river in tp. 19-4-5. Survey of Moraine road in tps. 27 and 28-6-5.
Bélanger, P. R. A. . . . .	Ottawa, Ont. . . . .	Inspection of contracts Nos. 4, 6 and 19 of 1913, and Nos. 5, 6, 7, 8, 10, 11, 12 and 15 of 1914. Subdivision surveys in tp. 80-11-5 and tp. 80-12-5.
Bennett, G. A. . . . .	Tillsonburg, Ont. . . . .	Stadia surveys in tp. 36-14-3, tps. 35 and 36-15-3, tps. 35 and 36-16-3, tp. 35-17-3, tps. 31, 34 and 35-19-3, tps. 32 and 33-20-3, tps. 32, 34 and 36-21-3, tps. 31, 32, 33, 34, 35 and 36-22-3, tp. 34-23-3, tps. 27, 28, 29 and 30-24-3, tps. 27, 28, 29 and 30-25-3, tps. 27, 28, 29 and 30-26-3, tps. 27, 28, 29 and 30-27-3, tps. 26, 27, 28, 29 and 30-28-3, tps. 27, 28, 29 and 30-29-3, tps. 27 and 29-1-4, and tp. 28-3-4. Retracement surveys in tp. 32-14-4, tps. 31 and 32-15-4, tp. 34-16-4, tps. 34 and 37-17-4, tps. 35 and 36-18-4, tp. 35-27-4, tps. 34 and 35-28-4, and tp. 34-29-4. Correction surveys in tp. 38-18-4, tp. 38-19-4, tp. 37-25-4, and tps. 41 and 42-28-4. Traverse in tp. 55-24-4.
Blanchet, G. H. . . . .	Ottawa, Ont. . . . .	Survey of the 24th base line across ranges 12 to 25, and the 25th base line across ranges 13 to 25, west of the Fourth meridian. Retracement of the 24th base line across part of range 11, and the 25th base line across part of range 12, west of the Fourth meridian.
Boivin, E. . . . .	Chicoutimi, Que. . . . .	Contract No. 16 of 1914. Subdivision of tps. 78, 79, 80, 81 and 82-17-4, and the north third of tp. 77-17-4.



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SCHEDULE of Surveyors employed and work executed by them from April 1, 1914, to  
March 31, 1915—*Continued.*

Surveyor.	Address.	Description of Work.
Boulton, W. J. . . . .	Wallaceburg, Ont. . . . .	Stadia surveys in tps. 7, 8, 9 and 10-15-4, tps. 7, 8, 9, 10, 11 and 12-16-4, tps. 7, 8, 9, 10, 11 and 12-17-4, tps. 7, 8, 9, 10 and 11-18-4, tps. 7, 8, 9 and 10-19-4, and tps. 8 and 9-20-4.
Bowman, E. P. . . . .	West Montrose, Ont. . . . .	Stadia surveys in tps. 7, 8, 9 and 10-15-4, tps. 37, 38, 39, 40 and 41-14-3, tps. 37, 38, 39, 40 and 41-15-3, tps. 36, 37, 38, 39 and 40-16-3, tps. 36, 37, 38, 39, 40 and 41-17-3, tps. 37, 38, 39, 40 and 41-18-3, tps. 51 and 52-21-3, tps. 51, 52 and 53-22-3, tps. 52 and 53-23-3, tps. 52 and 53-24-3, and tp. 52-25-3.
Brenot, L. . . . .	Ottawa, Ont. . . . .	Survey of the east outlines of tps. 81, 83 and 84-24-6, and tps. 80, 83, and 84-25-6. Subdivision in tp. 83-17-6, tps. 82 and 83-18-6, and tps. 79, 80 and 82-24-6. Traverse in tp. 83-21-6, and tp. 81-25-6. <b>Resurvey of Hudson's Bay Company's posts at Fort St. John and Hudson Hope.</b>
Bridgland, M. P. . . . .	Calgary, Alta. . . . .	Photo-topographical survey of the southern part of the Crownstest Forest Reserve. Retracement of the triangulation of the Rocky and Selkirk mountains.
Brownlee, J. H. . . . .	Vancouver, B.C. . . . .	Survey of road from sec. 32, tp. 17, E.C.M., to sec. 19, tp. 18, E.C.M.
Buchanan, J. A. . . . .	Edmonton, Alta. . . . .	Contract No. 13 of 1914. Subdivision of tps. 85, 86 and 87-21-5, and tps. 85, 86, 87 and 88-22-5.
Caider, J. A. . . . .	Lytton, B.C. . . . .	Subdivision in tps. 22 and 23-20-6, tp. 22-21-6, tps. 17, 18, 19 and 20-24-6, tps. 17 and 18-25-6, tps. 15, 16 and 17-26-6, and tp. 17-27-6. Traverse in tp. 23-20-6, tp. 22-21-6, tps. 18 and 19-24-6, tps. 17 and 18-25-6, and tps. 15 and 17-26-6.
Christie, W. . . . .	Prince Albert, Sask. . . . .	Subdivision of tp. 71-20-4, tps. 70 and 71-21-4, and tps. 70 and 71-22-4; part subdivision of tp. 70-20-4, and tp. 72-22-4. Survey of east outline of tp. 72-21-4.
Coltham, G. W. . . . .	Aurora, Ont. . . . .	Stadia surveys in tps. 43, 45, 46 and 47-8-4, tps. 42, 43, 44, 45, 46 and 47-9-4, tps. 42, 43, 44, 45, 46, 47 and 48-10-4, tps. 42, 43, 44, 45, 46, 47 and 48-11-4, tps. 43, 44, 45, 46, 47 and 48-12-4, tps. 43, 44, 45 and 46-13-4, and tps. 43, 44, 45, 46 and 47-14-4.
Coté, J. M. . . . .	Ottawa, Ont. . . . .	Subdivision in tp. 4-7-4, tps. 3 and 4-8-4, and tp. 3-9-4. Resurvey in tp. 51-23-3, tp. 51-24-3, tp. 22-10-4, tp. 21-11-4, tps. 21 and 22-12-4, and tp. 54-19-4. Correction survey in tp. 38-28-4, and 38-1-5. Retracement survey in tp. 20-1-4, and tp. 20-2-4.
Cowper, G. C. . . . .	Weland, Ont. . . . .	Stadia surveys in tps. 11, 12, 13 and 14-8-3, tps. 11, 12, 13 and 14-9-3, tps. 11, 12, 13 and 14-10-3, tps. 11, 12, 13, 14 and 15-11-3, tps. 11, 12, 13 and 14-12-3, tps. 11, 12, 13, 14, 15 and 16-13-3, tps. 11, 12, 13, 14, 15 and 16-14-3, tps. 11, 12, 13 and 14-15-3, tps. 10, 11 and 14-16-3, tps. 11, 12 and 13-17-3, tps. 9, 11, 12, 13, 14, 19 and 22-18-3, tps. 11, 12, 13, 14, 22 and 23-19-3, tps. 7, 8, 9, 10, 11, 12, 13 and 23-20-3, tp. 11-21-3, tp. 11-22-3, tp. 11-23-3, tp. 11-24-3, tps. 11, 12 and 17-25-3, tps. 11, 12 and 17-26-3, tps. 11, 12, 13, 14, 15, 16 and 17-27-3, tps. 11, 12, 13, 14, 15, 16 and 17-28-3, tps. 11, 12, 13, 14, 15, 16, 17 and 18-29-3, tps. 11, 12, 13, 14, 15, 16 and 17-30-3, and tps. 13 and 14-1-4.



## SESSIONAL PAPER No. 25b

SCHEDULE of Surveyors employed and work executed by them from April 1, 1914, to March 31, 1915—*Continued.*

Surveyor.	Address.	Description of Work.
Cumming, A. L. . . . .	Cornwall, Ont. . . . .	Subdivision of tp. 82-21-5 and tp. 82-22-5. Partial subdivision of tp. 84-20-5, tp. 83-21-5, tp. 83-22-5, and tp. 82-23-5. Traverse in tp. 70-27-4, tp. 72-2-5, tp. 72-3-5, tps. 72 and 73-9-5, and tp. 73-10-5. Retracement in tp. 73-6-5, tp. 84-21-5, tp. 84-22-5, and of lot 21, group 1, in tp. 72-2-5. Resurvey of road through lots 1 and 2 of Athabaska settlement.
Davies, T. A. . . . .	Edmonton, Alta. . . . .	Contract No. 10 of 1914. Subdivision of tp. 81-21-5, tp. 81-22-5, tp. 81-23-5, tps. 78, 79 and 80-24-5, and the west half of tp. 81-20-5.
Day, H. S. . . . .	Edmonton, Alta. . . . .	Contract No. 17 of 1914. Subdivision of tp. 83-16-4, and tps. 83, 84, 85 and 86-17-4. Survey of the east outlines of tps. 81, 82 and 84-16-4, tps. 81 and 82-17-4, and tps. 81 and 82-18-4.
Deans, W. J. . . . .	Brandon, Man. . . . .	Inspection of contracts Nos. 13 and 26 of 1912, Nos. 21, 24, 25, 26, 27 and 28 of 1913, and Nos. 20 and 21 of 1914. Partial inspection of contract No. 13 of 1911. Subdivision of summer resort at Madge Lake in tp. 30-30-Pr., of lots in tp. 15-5-Pr., and in tps. 32 and 33-13-Pr. Survey of part of Grand Rapids settlement. Inspection of work done by R. J. Jephson in 1912.
Evans, S. L. . . . .	Corinth, Ont. . . . .	Subdivision survey in tp. 24-8-3 and tp. 24-9-3. Resurvey in tp. 39-13-3, tp. 16-21-3, and tp. 23-23-3. Retracement survey in tps. 24 and 26-8-3, tps. 24, 25 and 26-9-3, and tp. 26-10-3. Subdivision of lots at Clear Lake in tp. 19-19-Pr. Topographical survey of site for summer resort at Madge Lake in tp. 30-30-Pr.
Fawcett, S. D. . . . .	Ottawa, Ont. . . . .	Settlement surveys at Pelican, Hay River and Fort Providence. Surveys of additions to settlements at Fort Resolution and Fort Simpson.
Fletcher, J. A. . . . .	Ottawa, Ont. . . . .	Survey of the 26th base across ranges 1 to 17, west of the Fifth meridian, and of the 27th base across ranges 1 to 9, west of the Fifth meridian.
Fletcher, W. A. . . . .	Thornton, Ont. . . . .	Stadia surveys in tp. 26-10-2, tps. 25, 26 and 27-11-2, tps. 25, 26 and 27-12-2, tps. 24, 25, 26, 27, 27a and 28-13-2, tp. 27a-13a-2, tps. 25, 26, 27 and 27a-14-2, and tp. 27a-15-2.
Fontaine, L. E. . . . .	Lévis, Que. . . . .	Inspection of contracts Nos. 2, 9, 13, 14, 16, 17, 18 and 19 of 1914. Subdivision in tp. 77-24-5. Retracement survey in tps. 70 and 78-5-6, tps. 72 and 78-6-6, tp. 71-7-6, and tp. 72-8-6. Traverse in tp. 77-24-5, tps. 71 and 72-7-6, tp. 72-8-6, tp. 71-10-6, and tp. 70-11-6.
Francis, John. . . . .	Portage la Prairie, Man. . . . .	Contract No. 20 of 1914. Subdivision of tps. 34 and 35-8-Pr., and tps. 34, 35 and 36-9-Pr.
Galletly, J. S. . . . .	Oshawa, Ont. . . . .	Subdivision in tp. 64-14-Pr., tps. 63 and 64-15-Pr., tps. 63 and 64-16-Pr., tp. 62-18-Pr., tps. 61 and 62-19-Pr., tp. 61-24-Pr., and tp. 56-27-Pr. Survey of east outlines of tp. 64-17-Pr., and tps. 61, 63 and 64-18-Pr. Traverse in tp. 63-18-Pr., tp. 56-26-Pr., and tp. 56-27-Pr. Survey of lot in tp. 65-26-Pr. Mounding in tps. 57 and 58-26-Pr.
Gibbon, Jas. . . . .	Vancouver, B.C. . . . .	Subdivision in tp. 7-23-6, tps. 6 and 7-24-6, and tps. 5 and 6-25-6. Traverse in tp. 7-23-6, tps. 6 and 7-24-6, and tps. 5 and 6-25-6.
Glover, A. E. . . . .	Beaverton, Ont. . . . .	Contract No. 5 of 1914. Subdivision of tps. 71, 72 and 73-25-5, and tps. 70, 71, 72 and 73-26-5. Survey of the east outline of tp. 69-27-5.
Green, T. D. . . . .	Ottawa, Ont. . . . .	Subdivision of tp. 36-8-5, tp. 40-10-5, and part of tp. 35-8-5.



6 GEORGE V, A. 1916

SCHEDULE of Surveyors employed and work executed by them from April 1, 1914, to March 31, 1915—*Continued.*

Surveyor.	Address.	Description of Work.
Griffin, A. D. . . . .	Elk Lake, Ont. . . . .	Contract No. 19 of 1914. Subdivision of tp. 91-9-4, tps. 92 and 93-10-4, tp. 88-11-4, tp. 88-12-4, and parts of tp. 90-9-4 and tp. 91-10-4. Survey of the east outline of tp. 92-9-4.
Hawkins, A. H. . . . .	Listowel, Ont. . . . .	Survey of the Principal meridian from the 21st to the 23rd base line and the 22nd base line across range 1, west of the Principal meridian, and range 1, east of the Principal meridian. Retracement of the Second meridian from the NE corner tp. 56-1-2 to NE corner sec. 12, tp. 85-1-2, and of the 15th base line across ranges 1 to 21, west of the Second meridian.
Heathcott, R. V. . . . .	Edmonton, Alta. . . . .	Contract No. 12 of 1914. Subdivision of tps. 78 and 79-14-5, tps. 78 and 79-15-5, tps. 78 and 79-16-5, the north third of tp. 77-14-5, and the north two-thirds of tp. 77-15-5. Survey of the east outlines of tps. 80-14-5, tp. 80-15-5, and tp. 80-16-5.
Herriot, G. H. . . . .	Ottawa, Ont. . . . .	Survey of the 19th base line across ranges 1 to 5, the 21st base line across ranges 12 to 20, and the 22nd base line across ranges 21 and 22, east of the Principal meridian. Survey of the Second meridian east, from the 22nd to the 23rd base line, the 23rd base line across ranges 1 to 11, and the 24th base line across range 11, east of the Second meridian east. Survey of the east outline of tps. 81, 82, 83 and 84-20-E., and tps. 89, 90, 91 and 92-11, E. 2 E.
Holcroft, H. S. . . . .	Toronto, Ont. . . . .	Subdivision of lots at Fort Churchill. Retracement of Hudson's Bay Company's reserve and Royal Northwest Mounted Police reserve at Fort Churchill.
Jackson, J. E. . . . .	Hamilton, Ont. . . . .	Contract No. 21 of 1914. Subdivision of tps. 27 and 28-3-E., tps. 25, 26 and 27-5-E., and tps. 26 and 27-6-E.
Johnston, J. H. . . . .	Edmonton, Alta. . . . .	Contract No. 14 of 1914. Subdivision of tps. 85, 86, 87, 88 and 89-20-5, and tps. 88 and 89-21-5.
Johnston, W. J. . . . .	St. Catharines, Ont. . . . .	Subdivision in tps. 22 and 23-1-6, tps. 22 and 23-2-6, tps. 19 and 20-5-6, tps. 18, 19, 22 and 23-6-6, tp. 22-7-6, tp. 21-12-6, and tp. 21-13-6. Traverse in tps. 22 and 23-1-6, tps. 22 and 23-2-6, tp. 19-5-6, tps. 18 and 19-6-6, tp. 23-10-6, tps. 20, 21 and 22-12-6, and tp. 21-13-6. Stadia surveys in tps. 20 and 21-29-5 and tp. 21-1-6.
LeBlanc, P. M. H. . . . .	Ottawa, Ont. . . . .	Subdivision of tp. 107-14-5, tp. 106-15-5, and tp. 108-17-5. Partial subdivision of tp. 108-5-5, tps. 108 and 109-11-5, tps. 108 and 109-12-5, tp. 109-13-5, tp. 104-14-5, tps. 107 and 108-15-5, tp. 108-16-5, and tp. 108-18-5. Survey of the east outlines of tps. 105 and 106-14-5, tp. 105-15-5, tp. 105-16-5.
Lonergan, G. J. . . . .	Buckingham, Que. . . . .	Inspection of work performed by daily-paid surveyors in Manitoba, Saskatchewan, Alberta, and British Columbia.
MacLeod, G. W. . . . .	Edmonton, Alta. . . . .	Contract No. 2 of 1914. Subdivision of tp. 75-10-6, tp. 69-11-6, tps. 69, 70, 71 and 72-12-6, tps. 78 and 79-16-6, and the north two-thirds of tp. 74-10-6. Survey of the east outlines of tps. 77 and 80-17-6.
Martyn, O. W. . . . .	Regina, Sask. . . . .	Survey of the townsite of Wymark, Sask., in tp. 13-13-3.



## SESSIONAL PAPER No. 25b

SCHEDULE of Surveyors employed and work executed by them from April 1, 1914, to March 31, 1915—*Continued.*

Surveyor.	Address.	Description of Work.
Matheson, H. . . . .	Ottawa, Ont. . . . .	Topographical survey near Jasper, in the valleys of Athabaska and Miette rivers. Survey of the corral near Jasper. Posting of a portion of the townsite of Jasper. Survey of coal lease in tp. 49-26-5.
Melhuish, P. . . . .	Vancouver, B.C. . . . .	Subdivision in tp. 3-28-6, tp. 4-29-6, tp. 3-30-6, tp. 5-4-7, tp. 24, E.C.M. and tp. 39, W.C.M. Traverse in tp. 3-28-6, tp. 4-29-6, tp. 3-30-6, tp. 5-4-7, tp. 24, E.C.M., and tp. 39, W.C.M. Survey of addition to the townsite of Woodhaven.
McKay, R. B. . . . .	Vancouver, B.C. . . . .	Latitude observations on the Fourth meridian, the Fifth meridian and the Sixth meridian, in northern Alberta.
McKnight, J. H. . . . .	Simcoe, Ont. . . . .	Stadia surveys in tp. 48-10-2, tps. 31, 32 and 33-12-2 tps. 32 and 33-13-2, tps. 35, 36 and 38-14-2, tps. 35, 36, 37 and 38-15-2, tps. 31, 36, 37 and 38-16-2, tps. 34, 35, 36, 37 and 38-17-2, tps. 33, 35, 36, 37 and 38-18-2, and tps. 33, 34, 35, 36, 37 and 38-19-2.
McMaster, W. A. A. . . . .	Prince Albert, Sask. . . . .	Resurvey in tp. 46-25-2. Retracement in tp. 47-26-2, tps. 47 and 48-27-2, and tp. 47-28-2. Resurvey of part of Prince Albert settlement. Subdivision in tp. 51-1-3.
Narraway, A. M. . . . .	Ottawa, Ont. . . . .	Survey of the 6th base line across range 10 and part of range 11, the 12th base line across ranges 2 and 3, and the 13th base line across part of range 1, west of the Principal meridian, and ranges 1, 2 and part of range 3, east of the Principal meridian. Survey of the east outlines of tps. 45, 46, 47 and 48-1-E., and of tps. 38, 39, 40, 41, 42, 43 and 44-3-E.
Neelands, R. . . . .	Hamiota, Man. . . . .	Stadia surveys in tp. 44-21-2, tp. 44-22-2, tps. 38, 39, 40, 41 and 42-25-2, tps. 38, 39, 40, 41 and 42-26-2, tps. 38, 39, 40, 41, 42, 43, 44, 45 and 45a-28-2, tps. 41, 42, 42a, 43 and 44-1-3, and tps. 52 and 53-7-3.
Norrish, W. H. . . . .	Guelph, Ont. . . . .	Subdivision in tps. 13, 14 and 15-23-6, tp. 16-24-6, and tps. 11, 12 and 13-26-6. Traverse in tps. 14 and 15-23-6, tp. 16-24-6, tps. 11, 12 and 13-26-6, and tp. 13-27-6.
(This work was originally allotted to Mr. A. E. Hunter, but on his decease it was continued by Mr. Norrish.)		
Palmer, P. E. . . . .	Dorchester, N.B. . . . .	Subdivision in tps. 69 and 70-7-Pr., tps. 68 and 69-8-Pr., tps. 67 and 68-9-Pr., tps. 65, 66 and 67-10-Pr., tps. 65 and 66-11-Pr., tp. 65-12-Pr., and tps. 64 and 65-13-Pr. Survey of island in Saskatchewan river in tp. 56-26-Pr.
Pearson, H. E. . . . .	Edmonton, Alta. . . . .	Contract No. 15 of 1914. Subdivision of tps. 79, 80 and 81-25-4, tps. 79, 80 and 81-26-4, and tps. 79, 80 and 81-1-5. Survey of the east outlines of tps. 77 and 78-25-4, tps. 77 and 78-26-4, and tps. 77 and 78-2-5.
Pierce, J. W. . . . .	Ottawa, Ont. . . . .	Contract No. 18 of 1914. Subdivision of tp. 87-16-4, tp. 87-17-4, the north two-thirds of tp. 87-12-4, tp. 87-13-4, tp. 87-14-4, and tp. 87-15-4, and the south third of tp. 88-13-4, tp. 88-14-4, tp. 88-15-4, and tp. 88-16-4. Survey of the east outlines of tps. 85 and 86-16-4, tps. 85 and 86-17-4, and tp. 88-18-4.
Pinder, G. Z. . . . .	Edmonton, Alta. . . . .	Contract No. 11 of 1914. Subdivision of tp. 79-18-5, tp. 79-19-5, tps. 79 and 80-20-5, tps. 79 and 80-21-5, and part of tp. 80-19-5. Survey of the east outlines of tp. 78-19-5, and tp. 78-20-5.
Ponton, A. W. . . . .	Edmonton, Alta. . . . .	Contract No. 6 of 1914. Subdivision of tp. 73-21-5, tps. 73 and 74-22-5, tps. 73 and 74-23-5, tp. 73-24-5, and the south two-thirds of tp. 75-22-5, and tp. 75-23-5.



SCHEDULE of Surveyors employed and work executed by them from April 1, 1914, to March 31, 1915—*Continued.*

Surveyor.	Address.	Description of Work.
Purser, R. C. . . . .	Windsor, Ont. . . . .	Subdivision in tps. 29 and 30-13-3, tps. 23, 24 and 25-15-3, and tp. 24-16-3. Retracement in tps. 14 and 15-1-Pr., tps. 14 and 15-2-Pr., tp. 15-3-Pr., tp. 9-27-Pr., tp. 21-31-Pr., tp. 23-19-2, tps. 3 and 7-20-2, tps. 5 and 7-21-2, tps. 7 and 25-22-2, tp. 6-25-2, tps. 25 and 26-27-2, tp. 20-1-3, tp. 21-9-3, tp. 39-12-3, and tp. 48-20-3. Correction survey in tp. 25-17-2, tp. 40-18-2, tp. 4-29-2, tp. 4-30-2, tp. 14-3-3, tp. 39-13-3, tp. 19-15-3, and tps. 36 and 37-20-3. Investigation in tp. 12-31-Pr.
Rinfret, C. . . . .	Montreal, Que. . . . .	Stadia surveys in tps. 3, 4, 5, 6, 8, 9 and 10-19-2, tps. 9 and 10-20-2, tps. 8, 9 and 10-21-2, tps. 8 and 9-22-2, tps. 8 and 9-23-2, tp. 8-24-2, tps. 8 and 9-25-2, tps. 7, 8, 12 and 13-26-2, tps. 7, 8, 12 and 13-27-2, tps. 7, 12 and 13-28-2, tp. 7-29-2, tps. 7 and 8-30-2, tps. 5, 6 and 7-1-3, tps. 5, 6 and 7-2-3, and tps. 5 and 6-3-3.
Roberts, O. B. . . . .	Murray Harbour, P.E.I.	Stadia surveys in tps. 42 and 43-2-4, tp. 42-3-4, tps. 39, 41 and 42-5-4, tps. 38, 39, 40, 41 and 42-6-4, tp. 30-7-4, tps. 39 and 41-8-4, tps. 35, 36, 38, 39, 40, 41 and 42-9-4, tps. 35, 38, 39, 40, 41 and 42-10-4, tps. 39, 40, 41 and 42-11-4, tps. 39, 40, 41 and 42-12-4, tps. 40, 41 and 42-13-4, tps. 37, 38, 40, 41 and 42-14-4, tps. 37, 38, 40, 41 and 42-15-4, tps. 37, 38, 41 and 42-16-4, tps. 37, 38, 39 and 42-17-4, tps. 35, 36, 38 and 39-19-4, and tp. 39-20-4.
Segre, B. H. . . . .	Toronto, Ont. . . . .	Stadia surveys in tp. 20-22-2, tps. 19 and 20-23-2, tps. 19 and 20-24-2, tps. 17, 18, 19 and 20-25-2, tps. 17, 18, 19 and 20-26-2, tps. 17, 18, 19 and 20-27-2, tps. 17, 18, 19 and 20-28-2, tps. 17, 18, 19, 20 and 24-29-2, tps. 17 and 18-30-2, tps. 17, 18, 19, 20, 23, 24 and 28-1-3, tps. 20, 23 and 24-2-3, tps. 20, 22 and 23-3-3, tps. 19, 20, 21, 22 and 23-4-3, tps. 20, 21 and 22-5-3, tps. 21 and 22-6-3, tps. 19, 20, 21 and 22-7-3, and tps. 21 and 22-8-3.
Seibert, F. V. . . . .	Edmonton, Alta. . . . .	Survey of the 26th base line from the Fourth to the Fifth meridian.
Soars, H. M. R. . . . .	Edmonton, Alta. . . . .	Stadia surveys in tp. 60-12-4, tps. 51, 52 and 53-16-4, tps. 50, 51, 52, 53 and 54-17-4, tps. 50, 51, 52, 53, 54 and 58-18-4, tps. 51, 52, 53, 54 and 57-19-4, tps. 51, 52 and 53-20-4, tps. 49, 50, 51 and 52-21-4, tps. 49, 50, 51 and 52-22-4, and tps. 48, 51, 52 and 53-23-4.
Stewart, N. C. . . . .	Ottawa, Ont. . . . .	Subdivision in tp. 23-18-5, tps. 23 and 24-19-5, tps. 24 and 25-20-5, tps. 25 and 26-21-5, and tp. 26-22-5. Traverse in tps. 23 and 24-18-5, tps. 23 and 24-19-5, tps. 24 and 25-20-5, tps. 24, 25, 26 and 27-21-5, and tps. 26 and 27-22-5. Resurvey of lot 11, block 2, in the town of Golden in tp. 27-22-5.
Stock, J. J. . . . .	Ottawa, Ont. . . . .	Contract No. 8 of 1914. Subdivision of tps. 77 and 78-18-5, tps. 75, 76 and 78-19-5, tp. 78-20-5, and the south two-thirds of tp. 75-20-5.
Street, P. B. . . . .	Toronto, Ont. . . . .	Subdivision of tp. 70-6-Pr., and partial subdivision of tps. 70 and 71-5-Pr. Survey of the east outlines of tps. 69 and 72-5-Pr., tp. 69-6-Pr., and tp. 69-7-Pr.
Stuart, A. G. . . . .	Buckingham, Que. . . . .	Survey of the 2nd base line from the Second to the Fourth meridian, the Fourth meridian from the first base line to the north boundary of township 53 and the north boundaries of tp. 48-28-3, tps. 12, 16, 20, 24, 28 and 32-29-3, tps. 12 and 16-30-3, and tps. 12, 16, 20, 24, 28, 32 and 48-1-4. Retracement for bearings of tp. 23-12-Pr., tps. 23, 31, 32 and 33-13-Pr., and part of tp. 30-13-Pr.



## SESSIONAL PAPER No. 25b

SCHEDULE of Surveyors employed and work executed by them from April 1, 1914, to March 31, 1915—*Concluded*.

Surveyor.	Address.	Description of Work.
Taggart, C. H. . . . .	Kamloops, B.C. . . . .	Subdivision in tp. 20-14-6, tp. 22-16-6, tp. 23-17-6, tp. 23-18-6, tp. 24-19-6, tp. 24-20-6, tps. 21, 23 and 24-21-6, tp. 24-22-6, tp. 24-23-6, tp. 24-24-6, tps. 23 and 24-25-6, and tp. 23-26-6. Traverse in tp. 22-16-6, tp. 23-17-6, and tp. 20-18-6.
Tipper, G. A. . . . .	Braniford, Ont. . . . .	Contract No. 9 of 1914. Subdivision of tps. 77, 78, 79 and 80-25-5, and tps. 77, 78, 79 and 80-26-5.
Waddell, W. H. . . . .	Edmonton, Alta. . . . .	Contract No. 7 of 1914. Subdivision of tp. 73-18-5, tps. 73 and 74-19-5, tps. 73 and 74-20-5, tp. 74-21-5, and the south two-thirds of tp. 75-21-5. Survey of the east outline of tp. 73-22-5, and part of the east outline of tp. 75-20-5.
Walker, C. M. . . . .	Guelph, Ont. . . . .	Resurvey of Canmore townsite, blocks 1 and 2 of Banff townsite, and the north boundary section 32, tp. 24-10-5. Survey of Bankhead cemetery and additions to the townsite and villa lot section of Banff. Contour survey of the southwest slope of Tunnel mountain. Traverse and levels of roads in the vicinity of Banff, and levels and local improvements in the villa lot section of Banff. Supervision of the survey of roads in the Rocky Mountains park and Yoho park.
Wallace, J. N. . . . .	Calgary, Alta. . . . .	Precise levelling along the Canadian Northern railway from Winnipeg to Swan river, from Portage la Prairie to Lake Manitoba, from Ochre river to Lake Dauphin, from Sifton Junction to Lake Winnipegosis, from Prince Albert to Big river, and from Pas towards Port Nelson, a distance of ninety-nine miles from Pas.
Waugh, B. W. . . . .	Ottawa, Ont. . . . .	Survey of the 21st base line across ranges 10 and 11, the 22nd base line across ranges 12 to 20, and the 23rd base line across ranges 21 and 22, all east of the Principal meridian. Survey of the Second meridian east from the 23rd to the 24th base line, and the 24th base line across ranges 1 to 10, east of the Second meridian east. Survey of the east outlines of tps. 81, 82, 83 and 84-11-E., and tps. 85, 86, 87 and 88-20-E.



## APPENDIX No. 2.

SCHEDULE showing for each surveyor employed, the number of miles surveyed of township section lines, township outlines, traverses of lakes and rivers, and resurvey; also the cost of the same.

Surveyor.	Miles of section.	Miles of outline.	Miles of traverse.	Miles of resurvey.	Total mileage.	Total cost.	Cost per mile.	Day work or contract.
						\$	\$ cts.	
Akins, J. R.		136			136	20,871	153 46	Day.
Aylsworth, C. F.			26	130	156	9,292	59 56	Day.
Bennett, G. A.	10		110	151	271	5,435	20 06	Day.
Blanchet, G. H.		158		2	160	22,812	142 58	Day.
Boivin, E.	226	78	89		393	11,533	29 35	Contract.
Boulton, W. J.			269	2	271	5,405	19 95	Day.
Bowman, E. P.			172	97	269	4,766	17 72	Day.
Brenot, L.	54	89	44	3	190	12,032	63 33	Day.
Buchanan, J. A.	294	78	67		439	13,274	30 24	Contract.
Calder, J. A.	122		51		173	9,276	53 62	Day.
Christie, W.	316	79	32		427	13,860	32 45	Day.
Coltham, G. W.			230		230	4,244	18 45	Day.
Cote, J. M.	20		75	330	425	11,863	27 91	Day.
Cowper, G. C.	4		189	41	234	4,925	21 04	Day.
Cumming, A. L.	142	33	121	21	317	15,661	49 40	Day.
Davies, T. A.	270	54	43		367	11,634	31 70	Contract.
Day, H. S.	213	120	90		423	12,583	29 75	Contract.
Evans, S. L.	13	2	32	232	279	9,968	35 73	Day.
Fletcher, J. A.		157			157	25,276	160 99	Day.
Fletcher, W. A.			320	8	328	4,033	12 30	Day.
Francis, J.	210	72	20		302	8,746	28 96	Contract.
Galletly, J. S.	198	88	77		363	12,805	35 28	Day.
Gibbon, J.	48		55		103	10,803	104 88	Day.
Glover, A. E.	294	72	8	6	380	12,511	32 92	Contract.
Green, T. D.	111	23	19		158	9,743	61 66	Day.
Griffin, A. D.	252	113	89		454	13,331	29 36	Contract.
Hawkins, A. H.		60		296	356	38,722	103 15	Day.
Heathcott, R. V.	291	124	77		492	14,773	30 03	Contract.
Herriot, G. H.		240			240	37,000	154 17	Day.
Jackson, J. E.	199	57	82		338	8,966	26 53	Contract.
Johnston, J. H.	293	90	127		510	14,416	28 27	Contract.
Johnston, W. J.	127		121		248	9,709	39 15	Day.
Le Blanc, P. M. H.	309	97	38		444	28,834	64 94	Day.
Macleod, G. W.	363	114	52		529	15,636	29 56	Contract.
Melhuish, P.	42		54		96	9,086	94 65	Day.
McKnight, J. H.			209		209	4,231	20 24	Day.
McMaster, W. A. A.			14	76	90	4,400	48 88	Day.
Narraway, A. M.		99		1	100	14,176	141 76	Day.
Neelands, R.			472		472	5,094	19 79	Day.
Norrish, W. H.	60		59		119	9,053	76 07	Day.
Palmer, P. E.	223	83	87		393	11,008	28 01	Day.
Pearson, H. E.	303	138	118		559	15,181	27 16	Contract.
Pierce, J. W.	276	130	102		508	15,329	30 17	Contract.
Pinder, G. Z.	285	68	15		368	11,751	31 93	Contract.
Ponton, A. W.	304	74	6		384	12,415	32 33	Contract.
Purser, R. C.	17			89	106	5,568	52 53	Day.
Rinfret, C.			283	81	364	4,471	12 29	Day.
Roberts, O. B.			177	204	381	8,138	21 36	Day.
Segre, B. H.			46	34	80	4,585	57 31	Day.
Seibert, F. V.		146		1	147	25,260	171 84	Day.
Soars, H. M. R.			258		258	4,716	18 21	Day.
Stewart, N. C.	90		305		395	9,339	23 65	Day.
Stock, J. J.	260	42	34		336	9,964	29 66	Contract.
Street, P. B.	71	53	30		154	8,378	54 40	Day.
Stuart, A. G.				739	739	8,327	13 13	Day.
Taggart, C. H.	111		12		123	10,582	86 03	Day.
Tipper, G. A.	401		38		439	13,974	31 83	Contract.
Waddell, W. H.	278	90	97		465	13,286	28 57	Contract.
Waugh, B. W.		208			208	31,209	150 04	Day.
	7,100	3,270	5,141	2,544	18,055	734,253	.....	



SESSIONAL PAPER No. 25b

## APPENDIX No. 3.

SURVEYS in the Yukon Territory, returns of which have been received during the year,

## LOT SURVEYS.

## GROUP No. 5.

Lot Number.	Acres.	Surveyor.	Year of Survey.	Date of Approval.	Claimant.	Remarks.
147	48.69	H. G. Dickson..	1913	July 4, 1914	Hamilton Yukon Mining Co.	"Canyon" mineral claim.
184	30.57	" ..	1913	" 4, 1914	" " "	"Palace" "
199	50.56	" ..	1913	" 4, 1914	" " "	"Wentworth" "
200	51.26	" ..	1913	" 6, 1914	F. J. Nicholson.....	"Brown Cub" "
224	43.19	" ..	1913	" 6, 1914	Henry Baxter.....	"Black Cub" "
227	51.54	" ..	1913	Jan 18, 1915	D. C. Campbell.....	"Wonder" "

## GROUP No. 6.

54	49.03	H. G. Dickson..	1913	July 6, 1914	Donald Ross, <i>et al.</i> .....	"Acme" mineral claim:
108	50.51	" ..	1913	" 6, 1914	" " .....	"Acme" No. 2 "
124	29.44	" ..	1913	" 6, 1914	" " .....	"Alice" "
125	27.08	" ..	1913	" 6, 1914	" " .....	"Ross" "
126	51.55	" ..	1913	" 6, 1914	" " .....	"Comstock" No. 2 "
127	46.93	" ..	1913	" 6, 1914	" " .....	"Comstock" "
128	26.76	" ..	1913	" 6, 1914	" " .....	"Silver King" "
129	51.61	" ..	1913	" 6, 1914	" " .....	"Silver King" No. 2 "
130	39.43	" ..	1914	.....	Howard Cochrane, <i>et al.</i> .....	"Rip" "
131	39.43	" ..	1914	.....	" " .....	"Mavis" "
132	51.65	" ..	1914	.....	" " .....	"Maid Marion" "
133	51.65	" ..	1914	.....	" " .....	"Mountain Sheep" "
134	23.89	" ..	1914	.....	" " .....	"Ptarmigan" "
135	35.48	" ..	1914	.....	" " .....	"Wheaton" "
136	48.16	" ..	1914	.....	" " .....	"Whirlwind" "
137	33.18	" ..	1914	.....	" " .....	"Idelle" "

## GROUP No. 10.

38	51.65	F. H. Kitto ..	1913	May 27, '14.	J. Paul Guite.....	"North Star" mineral claim.
39	44.36	" .....	1913	" 27, '14.	H. Boulais & J. O. Lachapelle	"Centre Star" "
40	41.88	" .....	1913	" 27, '14.	O. Vachon, <i>et al.</i> .....	"Alice" "
41	50.15	" .....	1913	" 27, '14.	L. A. Herdt.....	"Jeanette" "

## GROUP No. 12.

6	138.75	F. H. Kitto....	1914	Dec. 9, '14.	C. L. Snell .....	Homestead.
8	18.4	" .....	1914	Nov. 20, '14.	J. E. Binet.....	Surface.
9	10.00	" .....	1914	Dec. 9, '14.	C. L. Snell.....	"



## GROUP. No. 901.

Lot Number.	Acres.	Surveyor.	Year of Survey.	Date of Approval.	Claimant.	Remarks.
1	160.00	H. G. Dickson	1913		Skolai Pass Mining Co	"Solomon Copper" mineral claim.
2	150.63	"	1913		Solomon Albert	"Solomon" Extension No. 1 mineral claim.
3	157.96	"	1913		J. R. Slaggard	"Solomon" Extension No. 2 mineral claim.
4	91.28	"	1913		Mike Day	"King Midas Copper" mineral claim.
5	81.35	"	1913	Feb. 22, '15	The N. A. T. & T. Co.	"Sunrise" mineral claim.
6	49.97	"	1913		H. G. Blankman	"Golden Crown" "
7	41.34	"	1913		"	"Homestake" "
8	36.51	"	1913		The Skolai Pass Mining Co.	"Lucky Hit" "
9	50.56	"	1913		"	"Nellie" "
10	51.65	"	1913	Mar. 8, '15	The N. A. T. & T. Co.	"Silver Fox" "
11	51.65	"	1913	" 8, '15	"	"Black Fox" "
12	51.65	"	1913	" 8, '15	"	"Beaver" "
13	51.65	"	1913	" 8, '15	"	"Eldorado" "
14	31.88	"	1913		H. G. Blankman	"Eastern Star" "
15	22.69	"	1913	Mar. 25, '15	The N. A. T. & T. Co.	"Lost Treasure" "
17	160.00	"	1913		Mike Day	"Rand" "
18	51.53	"	1913		"	"New Zealander" "
19	16.81	"	1913		The Skolai Pass Mining Co.	"Copper Queen" fraction' mineral claim.
20	33.87	"	1913	Mar. 25, '15	The N. A. T. & T. Co.	"Susie" mineral claim.
21	38.56	"	1913		H. G. Blankman	"Reta" "
22	46.41	"	1913		"	"Lyon" "
23	160.00	"	1913		"	"Copper Queen" mineral claim.
24	124.04	"	1914		J. W. McLean	"Trust" mineral claim.

## GROUP No. 1,054.

1	50.35	F. H. Kitto	1912	Apr. 4, '15	J. Stewart & Wm. Catto	"Victoria" mineral claim.
2	47.90	"	1912	" 4, '15	"	"Dublin King" "
3	40.13	"	1912	" 4, '15	"	"Happy Jack" "
4	46.60	"	1912	" 4, '15	"	"Kootenay" "
5	46.39	"	1912	" 4, '15	"	"Foundation" "
6	5.67	"	1912	" 4, '15	"	"Shamrock" "
7	2.92	"	1912	" 4, '15	"	"Victoria fraction" "
8	41.51	"	1912	" 4, '15	S. C. McKim	"Aien Aristenein" "
9	5.1	"	1914	Nov. 20, '14	J. E. Binet	Surface
10	5.0	"	1914	" 20, '14	Schogrin & Chasni	"

## MISCELLANEOUS SURVEYS.

Year.	Surveyor.	Description of Survey.
1914.	F. H. Kitto	Reference traverse between Bedrock creek and international boundary.
1913.	H. G. Dickson	Continuation Aishihik Lake Reference traverse.
1913.	"	Reference traverse Bullion creek to Kluane lake.
1913.	"	Base Line on Fourth of July Creek.
1913.	"	Section "E" (Ore Spur) British Yukon Railway Co.
1913.	"	Whitehorse Kluane Government Road.
1914.	F. H. Kitto	Base Lines on Sixty-mile creek and tributaries, California, Twelve-mile and Five-mile creeks.



SESSIONAL PAPER No. 25b

## APPENDIX No. 4.

## DETAILS OF THE OFFICE WORK.

Letters and memoranda drafted.. . . .	15,077
Letters of instruction to surveyors.. . . .	321
Applications for various information dealt with.. . . .	3,220
Sketches made.. . . .	6,384
Maps and tracings made.. . . .	282
Areas calculated.. . . .	614
Pages of field notes copied.. . . .	345
Descriptions written.. . . .	30
Progress sketches received and filed.. . . .	1,600
Declarations of settlers received and filed.. . . .	229
Returns of timber berths received.. . . .	7
Plans received from surveyors.. . . .	1,111
Field books received from surveyors.. . . .	889
Timber reports received.. . . .	251
Observations for magnetic declination received.. . . .	1,439
Plans of Yukon lots received.. . . .	62
Plans of miscellaneous Yukon surveys received.. . . .	7
Returns of surveys examined:—	
Township subdivision.. . . .	842
Township outline.. . . .	563
Road plans.. . . .	541
Railway plans.. . . .	85
Miscellaneous Yukon surveys.. . . .	7
Yukon lots.. . . .	62
Mineral claims.. . . .	91
Timber berths.. . . .	7
Correction and other miscellaneous surveys.. . . .	217
Preliminary township plans prepared.. . . .	382
Township plans compiled.. . . .	905
Townsite settlement and other plans compiled.. . . .	39
Proofs of plans examined.. . . .	120
Township plans printed.. . . .	704
Township plans reprinted.. . . .	244
Townsite and settlement plans printed.. . . .	13
Sectional maps (3 miles to 1 inch):—	
Revised and reprinted.. . . .	15
Reprinted but not revised.. . . .	8
New maps compiled and printed.. . . .	14
Sectional maps (6 miles to 1 inch):—	
Reprinted.. . . .	14
New maps printed.. . . .	12
Files received and returned.. . . .	1,968
Books received from Record Office and used in connection with office work.. . . .	5,657
Books returned to Record Office.. . . .	4,167
Plans other than printed township plans received from Record Office and used in connection with office work.. . . .	1,046
Plans returned to Record Office.. . . .	775
Volumes of plans received from Record Office and used in connection with office work.. . . .	142
Volumes of plans returned to Record Office.. . . .	75
Books sent to Record Office to be placed on record.. . . .	780
Plans other than township plans sent to Record Office to be placed on record.. . . .	180



## APPENDIX No. 5.

SECTIONAL MAPS, of which new editions have been issued.

Scale, 3 miles to 1-inch.

No.	Name.	No.	Name.
20	Souris.	372	Minago.
66	Medicine Hat.	412	Wapiti.
113	Spillimacheen.	413	Iosegun.
114	Calgary.	414	Saulteux.
162	Seymour.	415	Tawatinaw.
172	Fairford.	416	La Biche.
173	Washow.	423	Sipiwesk.
213	Athabaska.	442	Wekusko.
263	Jasper.	462	Dunvegan.
314	St. Ann.	464	Giroux.
316	Vermilion.	465	Pelican.
317	Fort Pitt.	512	Montagneuse.
318	Shell River.	513	Heart River.
319	Prince Albert North.	515	Wabiskaw.
321	Cedar Lake.	563	Notikewin.
364	Fort Assiniboine.	566	McKay.
367	Meadow Lake.	663	Mustus.
368	Green Lake.	664	Mikkwa.
371	Cowan River.		

Scale, 6 miles to 1-inch.

20	Souris.	412	Wapiti.
113	Spillimacheen.	413	Iosegun.
173	Washow.	416	La Biche.
263	Jasper.	462	Dunvegan.
314	St. Ann.	464	Giroux.
316	Vermilion.	465	Pelican.
317	Fort Pitt.	512	Montagneuse.
318	Shell River.	513	Heart River.
319	Prince Alter North.	515	Wabiskaw.
321	Cedar Lake.	563	Notikewin.
367	Meadow Lake.	566	McKay.
368	Green Lake.	663	Mustus.
371	Cowan River.	664	Mikkwa.



## SESSIONAL PAPER No. 25b

APPENDIX No. 6.  
Work executed in the Photographic Office.

	3½ x 3½	3½ x 5½	5 x 7	8 x 10	10 x 12	11 x 14	15 x 18	18 x 20	20 x 24	24 x 32	25 x 35	30 x 36	36 x 42	42 x 48	Total.
Dry plates and films.....															789
Bromide prints.....		18	657												2,719
Solito prints.....		15	4	87	43	64	284	105	59	63		15	41	65	190
Velox prints.....			139	51											6,946
Vandyke prints.....	50	218	5,547	1,030		101		49	44	167		47	34	45	478
Blue-prints.....			47	6	21	15	24	186	205	574		279	120	202	1,668
Lantern slides.....	23		2	27		166	186								23
Photographs mounted.....		6	2,194			26	75		1	12					2,314
Wet plate negatives.....				101		296	1,310	258	73	100					2,138
Photo-litho plates.....								165	11		6	475			597
	73	257	8,590	1,302	64	2,606	1,879	703	393	616	6	816	195	312	17,812



## APPENDIX No. 7.

## Work executed in the Lithographic Office.

	MAPS.			TOWNSHIP PLANS.			FORMS.		
	No.	Copies.	Impres- sions.	No.	Copies.	Impres- sions.	No.	Copies.	Impres- sions.
1914.									
April.....	11	1,881	3,606	133	26,100	41,000	9	3,920	4,370
May.....	20	54,673	186,958	53	10,600	10,800	30	12,400	12,400
June.....	21	6,918	18,379	85	16,600	21,200	8	2,510	2,510
July.....	41	13,600	32,650	94	21,200	33,000	4	720	720
August.....	13	3,737	5,285	142	28,400	48,800	4	1,400	1,500
September.....	19	8,206	17,206	43	8,600	8,800	4	2,650	2,650
October.....	5	6,725	14,450	68	13,600	16,000	9	16,200	16,200
November.....	10	3,275	7,450	112	22,400	36,800	1	200	400
December.....				70	13,600	13,600	4	775	775
1915.									
January.....	7	2,015	6,015				8	1,950	1,950
February.....	22	29,000	103,400	55	11,000	11,000	7	26,060	26,060
March.....	20	6,275	6,370	192	38,400	70,800	16	12,500	12,500
Total.....	189	136,105	401,809	1047	210,500	311,800	104	81,285	82,035

## RECAPITULATION.

	No.	Copies.	Impressions.	Cost.
				\$ cts.
Maps.....	189	136,105	401,809	3,616.29
Township plans.....	1,047	210,500	311,800	2,800.00
Forms.....	104	81,285	82,035	738.32
Grand total.....	1,340	427,890	795,644	7,154.61



SESSIONAL PAPER No. 25b

## APPENDIX No. 8.

OFFICE STAFF of the Topographical Surveys Branch at Ottawa, as on April 1, 1915, with the name, classification, duties of office and salary of each. (Metcalf street, corner of Slater.)

NAME.	CLASSIFICATION.		Duties of Office.	Salary.
	Division.	Sub-division.		
				\$
Déville, E., D.T.S., LL.D. ....	1	A	Surveyor General. ....	4,000
Shanks, T., B.A.Sc., D.L.S. ....	1	A	Asst. Surveyor General. ....	2,900
Correspondence.				
Brady, M. ....	1	B	Secretary. ....	2,700
Cullen, M. J. ....	3	A	Clerk. ....	1,200
Williams, E. R. ....	3	A	" ....	1,100
Addison, W. G. ....	3	A	Stenographer. ....	1,000
Renault, J. F. ....	3	B	" ....	800
Laforce, D. ....	3	B	" ....	500
Pegg, A. ....			Messenger. ....	800
O'Meara, M. T. ....			" ....	700
Accounts.				
Hunter, R. H. ....	2	A	Accountant. ....	2,100
Lemay, A. ....	2	A	Asst. accountant. ....	1,700
McPhail, N. R. ....	2	B	" ....	1,050
Field work.				
Brown, T. E., B.A. ....	1	B	Supervisor of field work. ....	2,800

## DIVISION I.

## Survey Instructions and General Information.

Barber, H. G., Grad. S.P.S., D.L.S. ....	1	B	Chief of division. ....	2,300
Rice, F. W., Grad. School of Min., D.L.S.	2	A	Technical clerk. ....	2,050
MacIlquham, W. L., B.Sc., D.L.S. ....	2	A	" ....	2,050
Peaker, W. J., Grad. S.P.S. ....	2	A	" ....	1,750
Carroll, M. J., Grad. S.P.S. ....	2	A	" ....	1,750
Rochon, E. C. ....	2	A	" ....	1,700
McRae, A. D., B.A., B.Sc. ....	2	A	Supply clerk. ....	1,700
Grant, A. W., B.A. ....	2	A	Editor. ....	1,700
Hayward, H. E., B.Sc. ....	2	A	Registration clerk. ....	1,650
Macmillan, J. P., B.E. ....	2	B	Technical clerk. ....	1,450
Gagnon, J. N. H., B.A.S. ....	2	B	" ....	1,200
Armstrong, W. B., B.Sc. ....	2	B	" ....	1,350
Nevins, L. A., B.A. ....	2	B	" ....	1,350
McDonald, J. F., B.A. ....	2	B	Registration clerk. ....	1,350
Quinlan, L. J., B.A.Sc. ....	2	B	Technical clerk. ....	1,300
Gallagher, O. G., B.Sc. ....	2	B	" ....	1,250
Miller, A. H., B.A. ....	2	B	" ....	1,250
Morgan, A. L., B.Sc. ....	2	B	" ....	1,250
Campbell, D. H., B.A.Sc. ....	2	B	" ....	1,200
Thompson, N. A., B.Sc. ....	3	B	" ....	1,200
Burkholder, E. L. ....	3	A	Clerk. ....	1,100



## APPENDIX No. 8—Continued.

## DIVISION II.

## Examination of Survey Returns and Compilation of Plans.

Name.	CLASSIFICATION.		Duties of Office.	Salary.
	Division	Sub-division.		
				\$
Nash, T. S., Grad. S.P.S., D.L.S.	1	B	Chief of division	2,800
Dennis, F. M., B. Sc., D.L.S.	1	B	Surveys examiner	2,200
Hill, S. N., Grad. S.P.S., C.E.	1	B	"	2,200
Elder, A. J., Grad. S.P.S., D.L.S.	2	A	"	2,050
Genest, P. F. X., Q.L.S.	2	A	"	2,050
McClelland, W. D.	2	A	"	1,750
Roger, A., O.L.S., D.L.S.	2	A	"	1,750
Sutherland, H. E., B.Sc.	2	A	"	1,700
Ault, H. W.	2	A	"	1,700
Bray, R. P.	2	A	"	1,700
Spreckley, R. O.	2	A	"	1,650
Goodday, Leonard.	2	B	"	1,550
Harrison, E. W.	2	B	"	1,450
Lytle, W. J.	2	B	Recorder	1,200
LaBeree, E. E.	2	B	Surveys examiner	1,200
Jones, G. S., Grad. S.P.S., O.L.S., D.L.S.	2	B	"	1,200
Bradley, J. D.	2	B	"	1,200
Kirwan, G. L., B.A.Sc.	2	B	"	1,300
Callander, R., B.Sc.	2	B	"	1,250
Cram, R. M., B.Sc.	2	B	"	1,250
Timbrell, E. G., B.Sc.	2	B	"	1,250
Fraser, A., B.A.Sc.	2	B	"	1,200
DesLauriers, J.	2	B	"	1,600
Macdonald, J. A.	3	B	Clerk.	800

## DIVISION III.

## Drafting and Printing, (Imperial Building, Queen street.)

Engler, Carl, B.A., D.L.S.	1	B	Chief of division	2,400
May, J. E.	2	A	Draughtsman	2,050
Moule, W. J.	2	B	Litho-designer	1,600
Helmer, J. D.	2	B	Draughtsman	1,250
Dawson, R. J.	2	B	Stamper	1,250
Archambault, E.	2	B	Draughtsman & stamper.	1,250
Birchall, W. A.	2	B	Draughtsman	1,250
Hall, J.	2	B	"	1,200
Watters, James.	3	A	Printer	1,200
Brown, A.	3	A	Stamper	1,100
Ebbs, E. J.	3	A	"	1,100
Baril, C.	3	A	Clerk	950

## DIVISION IV.

## British Columbia Surveys, (Imperial Building, Queen street.)

Rowan-Legg, E. L.	2	A	Chief of division	2,100
Gillmore, E. T. B., Grad. R.M.C.	2	A	Surveys examiner	2,100
Morley, R. W.	2	A	"	2,050
Wilson, E. E. D., B.Sc.	2	A	"	1,800
Harris, K. D.	2	A	"	1,650



## SESSIONAL PAPER No. 25b

## APPENDIX No. 8—Continued.

## DIVISION V.

Mapping, (Imperial Building, Queen street.)

Name.	CLASSIFICATION.		Duties of Office.	Salary.
	Division	Sub-division		
				\$
Smith, J. ....	1	B	Chief of division .....	2,800
Henderson, F. D., Grad. S.P.S., D.L.S. ....	1	B	Technical clerk.....	2,200
Bégin, P. A. ....	2	A	Draughtsman.....	2,100
Blanchet, A. E. ....	2	A	" .....	1,650
D'Orsonnens, A. ....	2	A	" .....	1,750
Flindt, A. H. ....	2	A	" .....	1,850
Davies, T. E. S. ....	2	A	Recorder.....	1,650
Purdy, W. A. ....	2	A	Draughtsman.....	1,650
Bergin, W. ....	2	B	" .....	1,250
Blanchard, J. F. ....	2	B	Technical clerk.....	1,250
Colquhoun, G. A., B.Sc. ....	2	B	" .....	1,350
Davy, E. ....	2	B	Draughtsman.....	1,550
Fitzgerald, C. C., B.Sc. ....	2	B	Technical clerk.....	1,200
Hawes, J. H. B.A. Sc. ....	2	B	" .....	1,200
Howie, Jas. ....	2	B	Draughtsman.....	1,200
Perrin, V. ....	2	B	" .....	1,600
Squire, R. L., B.Sc. ....	2	B	Technical clerk.....	1,250
Villeneuve, E. ....	2	B	Draughtsman.....	1,250

## DIVISION VI.

Special Surveys, (Imperial Building, Queen street.)

Dodge, G. B., D.L.S. ....	1	B	Chief of division and Supt. Surveys Laboratory ....	2,800
Watt, G. H. Grad. S.P.S., D.L.S. ....	2	A	Computer.....	2,050
Way, W. C., M.Sc. ....	2	A	Asst. Supt. Sur. Laboratory	1,703
Milliken, J. B., B.A., B.Sc., D.L.S. ....	2	A	Examiner of baseline survey	1,650
Parry, H., B. Eng. D.L.S. ....	2	A	Mathematician.....	1,650
Cannell, H. W., D.L.S. ....	2	A	Computer.....	1,600
Doxsee, W. W. M.A. ....	2	B	Laboratory assistant.....	1,200
Dunlop, J. H., B.Sc. ....	2	B	Computer.....	1,200
Field, R. H. ....	2	B	Laboratory assistant.....	1,200
Herbert, W. H., B.Sc. ....	2	B	Computer .....	1,350
Hughson, W. G., B.Sc. ....	2	B	Laboratory assistant.....	1,300
Jeffrey, Miss G., B.A. ....	2	B	Computer.....	1,200
Linford, W. J. ....	2	B	Laboratory assistant.....	1,200
Roe, B. J. ....	2	B	Computer.....	1,300
Ross, R. C., B.Sc. ....	2	B	" .....	1,350
Lynch, F. J. ....	3	B	Stenographer.....	800
Watson, J. W. ....	3	B	Clerk.....	800
Pick, A. C. ....			Messenger.....	700

Chief Inspector of Surveys Office, (130 Wellington Street.)

Hubbell, E. W., D.L.S. ....	1	B	Chief Inspector.....	2,800
Sylvain, John....	2	B	Assistant .....	1,850
Stalker, Miss M. W. ....	3	A	Stenographer.....	1,100

Board of Examiners for D.L.S.

Côté, J. A., Grad. R.M.C. ....	2	A	Secretary .....	1,800
Nolan, Miss A. A. ....	3	B	Stenographer.....	550



6 GEORGE V, A. 1916

APPENDIX No. 8—*Concluded.*

Geographic Board, (Woods Building, Slater street.)

Name.	CLASSIFICATION.		Duties of Office.	Salary.
	Division	Sub-division		
Whitcher, A. H., F.R.G.S., D.L.S.....	2	A	Secretary.....	\$ 2,100

Photographic Office, (Metcalf street, corner Slater street.)

Carruthers, H. K.....	2	A	Process photographer....	2,050
Woodruff, John.....	2	A	Chief ".....	2,050
Owen, E. R.....	2	B	Asst. photographer.....	850
Collins, G. H. A.....	2	B	Photographer.....	1,050
Whitcomb, H. E.....	3	A	".....	1,200
Morgan, W. E.....	3	A	".....	1,200
Kilmartin, A.....	3	A	Asst. photographer.....	1,100
Ouimet, E. G.....	3	B	" ".....	1,000
Bourbeau, J. A.....			" ".....	700

Lithographic Office, (Imperial Building, Queen street.)

Name.	Occupation.	Salary.
Moody, A.....	Foreman.....	\$28 00 per week.
Burnett, E.....	Lithographer.....	25 00 "
Thicke, C. R.....	".....	24 00 "
Deslauriers, J. H.....	Transferrer.....	21 00 "
Bergin, J.....	Printer.....	22 00 "
Thicke, H. S.....	".....	21 00 "
Boyle, S.....	Stone polisher.....	16 00 "
Gagnon, J.....	Press feeder.....	13 00 "
Kane, P.....	".....	11 50 "
Easton, R. M.....	Printer.....	21 00 "
Hare, E. H.....	Asst. photographer.....	16 00 "
Gordon, W.....	Litho-transferrer.....	21 00 "
Perkins, I. J.....	Asst. phttographer.....	10 00 "



## SESSIONAL PAPER No. 25b

## APPENDIX No. 9.

LIST of Dominion Land Surveyors who are in possession of Standard Measures.

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Akins, James Robert.....	Ottawa, Ont.....	Sept. 2, '76	Mar. 14, '10	
Allison, Calvin Bruce.....	South Woodslee, Ont.....	June 16, '84	Mar. 28, '10	O.L.S.
Ashton, Arthur Ward.....	Not known.....	Nov. 5, '80	May 29, '08	B.C.L.S.
Austin George Frederick.....	Not known.....		April 14, '72	
Aylen, John.....	North Bay, Ont.....		May 29, '85	
Aylsworth, Charles Fraser.....	Madoc, Ont.....	April 21, '62	May 13, '86	O.L.S.
Baker, James Clarence.....	Vermilion, Alta.....	May 12, '78	May 18, '06	A.L.S.
Baker, Mason Hermon.....	St. Thomas, Ont.....	July 9, '84	Aug. 6, '08	O.L.S.
Bartlett, Ernest.....	Medicine Hat, Alta.....		Jan. 16, '11	A.L.S.
Bayne, George A.....	Winnipeg, Man.....	Oct. 25, '50	April 14, '72	M.L.S.
Beatty, David.....	Parry Sound, Ont.....	Dec. 22, '42	April 14, '72	O.L.S.
Beatty, Frank Weldon.....	Pembroke, Ont.....	July 12, '92	May 18, '14	
Begg, William Arthur.....	Hamilton, Ont.....	July 15, '82	June 8, '09	S.L.S.
Belanger, Phidime Roch Arthur	Ottawa, Ont.....	Mar. 5, '53	May 17, '80	Inspector of Surveys, Topographical Surveys Branch, Dept. of the Interior.
Belleau, Joseph Alphonse.....	Ottawa, Ont.....	Sept. 30, '56	May 15, '83	Land Patents Branch, Department of Interior.
Belyea, Albert Palmer Corey...	Edmonton, Alta.....		July 14, '09	A.L.S.
Bemister, George Bartlett.....	Winnipeg, Man.....		June 11, '78	M.L.S. Engineering Dept. C.N.R.
Bennett, George Arthur.....	Ottawa, Ont.....	May 18, '86	Aug. 25, '10	A.L.S.
Berry, Edward Wilson.....	Seaforth, Ont.....	Aug. 26, '81	May 18, '11	
Bigger, Charles Albert.....	Ottawa, Ont.....	Aug. 15, '53	Mar. 30, '82	B.C.L.S., O.L.S., Assist- ant Superintendent Geodetic Surveys.
Bingham, Edwin Ralph.....	Fort William, Ont.....		Oct. 25, '06	O.L.S.
Bingham, Harold Carr.....	Moosejaw, Sask.....	Aug. 7, '88	Mar. 13, '14	S.L.S.
Blanchet, Guy Houghton.....	Ottawa, Ont.....	Feb. 12, '84	Mar. 10, '10	
Boivin, Elzear.....	Edmonton, Alta.....	June 13, '57	Nov. 13, '83	
Boswell, Elias John.....	Montreal, Que.....	Sept. 26, '70	Mar. 18, '03	O.L.S., M.L.S.
Boulton, William James.....	Wallaceburg, Ont.....	Oct. 2, '84	Mar. 7, '12	
Bourgeault, Armand.....	St. Jean Port Joli, Que.....	Feb. 23, '58	Mar. 29, '83	Q.L.S.
Bourgault, Charles Eugene.....	Lauzon, Levis, Que.....	Sept. 6, '61	Feb. 21, '88	
Bourget, Charles Arthur.....	Lauzon, Que.....	Aug. 26, '51	May 14, '84	Q.L.S.
Bowman, Edgar Peterson.....	West Montrose, Ont.....	Sept. 29, '83	Sept. 26, '07	O.L.S.
Bowman, Herbert Joseph.....	Berlin, Ont.....	June 18, '65	Feb. 16, '88	O.L.S.
Brabazon, Alfred James.....	Ottawa, Ont.....		May 13, '82	Boundary Surveys, Dept. of the Interior.
Bray, Samuel.....	Ottawa, Ont.....	Nov. 5, '46	Nov. 14, '83	O.L.S., Chief Surveyor, Dept. of Indian Affairs.
Bray, Lennox Thomas.....	Edmonton, Alta.....	Mar. 14, '77	Feb. 18, '03	O.L.S., A.L.S.
Brenot, Lucien.....	Ottawa, Ont.....	Aug. 31, '87	Mar. 18, '10	
Bridglond, Morrison Parsons.....	Calgary, Alta.....	Dec. 20, '78	Mar. 10, '05	A.L.S.
Broughton, George Henry.....	Penticton, B.C.....	Aug. 12, '86	June 3, '09	B.C.L.S.
Brown, Charles Dudley.....	Winnipeg, Man.....	Feb. 25, '83	April 4, '10	A.L.S., S.L.S.
Brown, Edgar Carl.....	Winnipeg, Man.....	Nov. 28, '86	May 23, '11	A.L.S., S.L.S.
Brown, Thomas Wood.....	Saskatoon, Sask.....	Nov. 10, '79	June 21, '09	A.L.S., S.L.S.
Brownlee, James Harrison.....	Vancouver, B. C.....	Mar. 22, '56	April 15, '87	M.L.S., B.C.L.S., Direc- tor of Surveys, Yukon Territory.
Buchanan, John Alexander.....	Edmonton, Alta.....	Mar. 4, '87	May 17, '12	A.L.S.
Burd, James Henry.....	Weyburn, Sask.....	Sept. 7, '71	May 18, '11	O.L.S., S.L.S.
Burgess, Edward LeRoy.....	Kamloops, B.C.....	May 5, '78	Feb. 23, '05	O.L.S.
Burnet, Hugh.....	Victoria, B.C.....		June 22, '85	O.L.S., B.C.L.S.
Burwash, Nathaniel Alfred.....	Toronto, Ont.....	Sept. 28, '79	Mar. 6, '07	O.L.S.
Burwell, Herbert Mahlon.....	Vancouver, B.C.....	Oct. 23, '63	Feb. 17, '87	B.C.L.S.
Calder, John Alexander.....	Lytton, B.C.....	June 2, '86	May 21, '12	
Cameron, Charles Scott.....	Beaverton, Ont.....	Dec. 6, '84	Mar. 15, '13	
Campbell, Alan John.....	Sidney, B.C.....	Oct. 1, '82	April 13, '09	B.C.L.S., A.L.S.
Campbell, Alexander Stewart.....	Kingston, Ont.....	Mar. 7, '80	Mar. 6, '09	O.L.S.



APPENDIX No. 9—*Continued.*

LIST of Dominion Land Surveyors who are in possession of Standard Measures.—  
*Continued.*

Name.	Address.	Date of Birth,	Date of Appointment or of Commission.	Remarks.
Carbert, Joseph Alfred.....	Medicine Hat, Alta.	Feb. 4, '56	May 12, '80	O.L.S., A.L.S., District Engineer and Surveyor, Dept. of Public Works, Alberta.
Carpenter Henry Stanley.....	Regina, Sask.....	Feb. 8, '74	Feb. 20, '01	O.L.S., S.L.S., Department of Public Works.
Carroll, Cyrus.....	Regina, Sask.....	Dec. 6, '34	April 14, '72	O.L.S., S.L.S.
Carson, John Alton.....	Vancouver, B.C.....	Aug. 10, '89	May 18, '14	
Carson, Percy Alexander.....	Calgary, Alta.....	Dec. 25, '77	Feb. 22, '06	
Carthew, William Morden.....	Edmonton, Alta.....	Oct. 19, '86	Mar. 29, '10	A.L.S.
Carthew, John Trewalla.....	Edmonton, Alta.....	Feb. 15, '91	Mar. 15, '13	
Cautley, Reginald Hutton.....	Edmonton, Alta.....	Dec. 6, '79	May 1, '05	A.L.S.
Cautley, Richard William.....	Edmonton, Alta.....	Aug. 3, '73	Sept. 2, '96	A.L.S.
Cavana, Allan George.....	Orillia, Ont.....	Jan. 22, '58	Nov. 16, '76	O.L.S.
Charlesworth, Lionel Clare.....	Edmonton, Alta.....	Nov. 17, '73	Mar. 24, '03	O.L.S., A.L.S., Director of Surveys, Dept. of Public Works, Alberta.
Chase, Albert Victor.....	Orillia, Ont.....	Mar. 4, '83	Oct. 11, '10	O.L.S.
Chilver, Charles Alonzo.....	Walkerville, Ont.....	Feb. 8, '83	Feb. 22, '07	
Christie, William.....	Prince Albert, Sask.....	Feb. 13, '76	Mar. 22, '06	S.L.S.
Clarke, Frederick Fieldhouse.....	Toronto, Ont.....	Aug. 22, '78	Feb. 18, '08	O.L.S.
Clarke, Charles Wentworth.....	Regina, Sask.....	Nov. 19, '75	Mar. 24, '10	S.L.S.
Cleveland, Ernest Albert.....	Vancouver, B.C.....	May 12, '74	June 27, '99	B.C.L.S.
Coates, Preston Charles.....	Victoria, B.C.....	May 16, '81	April 19, '07	B.C.L.S.
Cokely, Leroy S.....	Duncan, B.C.....	Nov. 23, '84	Mar. 22, '10	B.C.L.S.
Coltham, George William.....	Aurora, Ont.....	Feb. 19, '89	Mar. 15, '13	O.L.S.
Cond, Fritz Thomas Percy.....	Vancouver, B.C.....	May 16, '86	May 18, '11	B.C.L.S.
Côté, Joseph Adelard.....	Prince Albert, Sask.....	June 5, '64	May 14, '84	S.L.S.
Côté, Jean Léon.....	Edmonton, Alta.....	May 6, '67	Mar. 21, '90	A.L.S.
Côte, Joseph Martial.....	Ottawa, Ont.....	Aug. 25, '89	May 13, '13	
Cotton, Arthur Frederick.....	Masset, B.C.....	Aug. 8, '52	May 11, '80	O.L.S., B.C.L.S.
Cowper, George Constable.....	Welland, Ont.....	Oct. 20, '86	Mar. 11, '11	
Craig, John Davidson.....	Ottawa, Ont.....	Jan. 30, '76	Feb. 24, '02	Boundary Surveys, Dept. of the Interior.
Cumming, Austin Lewis.....	Edmonton, Alta.....	Aug. 25, '82	Feb. 3, '10	A.L.S.
Cummings, Alfred.....	Fernie, B.C.....	July 3, '80	Mar. 3, '09	B.C.L.S.
Cummings, John George.....	Cranbrook, B.C.....	Nov. 19, '73	Feb. 17, '04	B.C.L.S.
Dalton, John Joseph.....	Weston, Ont.....	June 12, '54	April 17, '79	O.L.S., D.T.S.
Davies, Thomas Atwood.....	Edmonton, Alta.....		Feb. 22, '06	A.L.S.
Dawson, Frederick James.....	Kamloops, B.C.....	Sept. 22, '86	Sept. 12, '10	B.C.L.S.
Day, Harry Samuel.....	Edmonton, Alta.....	Nov. 14, '85	Mar. 9, '10	A.L.S.
Deans, William James.....	Brandon, Man.....	May 4, '60	May 13, '86	O.L.S., Inspector of Surveys, Dept. of the Interior.
de la Condamine, C.....	Calgary, Alta.....	Feb. 13, '75	May 4, '10	A.L.S.
Dennis, John Stoughton.....	Calgary, Alta.....	Oct. 22, '56	Nov. 19, '77	D.T.S., Asst. to President of C.P.R.
Denny, Herbert C.....	Not known.....		April 1, '82	
Dickson, Henry Godkin.....	Whitehorse, Y.T.....	Mar. 29, '64	Mar. 19, '89	M.L.S.
Dickson, James.....	Fenelon Falls, Ont.....	Oct. 30, '34	April 14, '72	O.L.S.
Dobie, James Samuel.....	Thessalon, Ont.....	Oct. 15, '73	Mar. 22, '06	O.L.S.
Donnelly, Cecil.....	Winnipeg, Man.....	Oct. 18, '89	Mar. 15, '13	M.L.S.
Doupe, Jacob Lonsdale.....	Winnipeg, Man.....	Sept. 14, '67	Oct. 6, '88	M.L.S., A.L.S., S.L.S., Asst. Land Commissioner for C.P.R.
Drewry, William Stewart.....	Victoria, B.C.....	Jan. 20, '59	Nov. 14, '83	O.L.S., B.C.L.S.
Driscoll, Alfred.....	Edmonton, Alta.....	July 2, '65	Feb. 23, '87	B.C.L.S., A.L.S.
Drummond, Thomas.....	Montreal, P.Q.....	1856	June 24, '78	D.T.S.
Ducker, William A.....	Winnipeg, Man.....	April 4, '52	Mar. 30, '83	O.L.S., M.L.S.
Duffield, Hugh Johnston.....	Calgary, Alta.....	Feb. 27, '72	May 18, '14	
Dumais, Paul T. Concorde.....	Hull, P.Q.....	Jan. 2, '47	Mar. 29, '82	Q.L.S.
Earle, Wallace Sinclair.....	Vancouver, B.C.....	Feb. 8, '89	May 18, '11	B.C.L.S., O.L.S.
Edwards, George.....	Ponoka, Alta.....	June 13, '42	April 14, '72	O.L.S., A.L.S.



## SESSIONAL PAPER No. 25b

APPENDIX No. 9—*Continued.*LIST of Dominion Land Surveyors who are in possession of Standard Measures—  
*Continued.*

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Edwards, William Milton.....	Lethbridge, Alta.....	June 21, '79	April 5, '10	A.L.S.
Ellacott, Charles Herbert.....	Victoria, B.C.....	Dec. 24, '66	Feb. 22, '99	B.C.L.S.
Ellis, Douglas Stewart.....	Kingston, Ont.....	Mar. 16, '85	May 17, '12	
Empey, John Morgan.....	Calgary, Alta.....	Apr. 16, '74	Feb. 23, '05	O.L.S., A.L.S.
Engler, Carl.....	Ottawa, Ont.....	Sept. 30, '72	Feb. 23, '05	T. S. Branch, Dept. of the Interior.
Evans, Stanley Livingstone.....	Corinth, Ont.....	Jan. 14, '84	Feb. 13, '11	
Ewan, Hedley Jenkins.....	Yarmouth N.S.....	Nov. 23, '91	Mar. 13, '14	
Fairchild, Charles Courtland.....	Edmonton, Alta.....	Feb. 21, '67	Feb. 20, '01	O.L.S., A.L.S.
Farncomb, Alfred Ernest.....	Edmonton (South) Alta.....	May 22, '73	Mar. 12, '02	O.L.S., A.L.S.
Fawcett, Adam.....	Gravenhurst, Ont.....		Feb. 22, '93	
Fawcett, Sydney Dawson.....	Ottawa, Ont.....	Oct. 29, '82	May 18, '11	
Fawcett, Thomas.....	Ottawa, Ont.....	Oct. 28, '48	Nov. 18, '76	O.L.S., D.T.S. Boundary Surveys Dept. of the Interior.
Ferguson, George Hendry.....	Ottawa, Ont.....	Jan. 20, '83	June 2, '09	
Findlay, Allan.....	Winnipeg, Man.....	Oct. 15, '80	Mar. 21, '08	M.L.S.
Fletcher, James Allan.....	Fletcher, Ont.....	Mar. 26, '89	May 18, '11	
Fontaine, Louis Elie.....	Levis, P.Q.....	Oct. 3, '68	Nov. 30, '92	A.L.S., Inspector of Surveys, Dept. of the Interior.
Francis, John.....	Portage la Prairie, Man.....	Dec. 22, '52	June 17, '75	M.L.S.
Galletly, James Simpson.....	Oshawa, Ont.....	April 15, '88	May 18, '11	
Garden, James Ford.....	Vancouver, B. C.....	Feb. 19, '47	May 13, '80	B.C.L.S.
Garden, George H.....	Lethbridge, Alta.....		April 14, '72	Deputy Surveyor for N.B.
Garden, Charles.....	Not known.....		April 14, '72	Deputy Surveyor for N.B.
Garner, Albert Coleman.....	Regina, Sask.....	Sept. 6, '78	May 27, '07	S.L.S., A.L.S. Chief Surveyor Surveys Branch Land Titles Offices.
Gauvreau, Louis Pierre.....	Not known.....		April 14, '72	
Gibbon, James.....	Vancouver, B. C.....	June 25, '60	Feb. 12, '91	O.L.S.
Glover, Arthur Edward.....	Edmonton, Alta.....	Mar. 4, '87	Mar. 11, '11	A.L.S., S.L.S.
Gordon, Maitland Lockhart.....	Vancouver, B. C.....	Sept. 27, '82	Feb. 18, '04	B.C.L.S.
Gordon, Robert John.....	Lethbridge, Alta.....	June 18, '69	Mar. 12, '02	A.L.S.
Gore, Thomas Sinclair.....	Victoria, B.C.....	1852	April 19, '79	B.C.L.S.
Graham, John Robertson.....	Vancouver, B. C.....	April 18, '87	May 26, '10	B.C.L.S.
Grassie, Charles Andrew.....	Medicine Hat, Alta.....	Dec. 24, '83	Dec. 27, '10	A.L.S.
Gray, James Edward.....	Edmonton, Alta.....	Oct. 12, '81	Mar. 11, '11	A.L.S., S.L.S.
Green, Alfred Harold.....	Nelson, B.C.....	Jan. 20, '79	Feb. 23, '05	B.C.L.S., A.L.S.
Green, Thomas Daniel.....	Rocky Mountain House, Alta.....	Dec. 21, '57	May 19, '84	O.L.S.
Green, Frank Compton.....	Victoria, B.C.....	May 4, '73	May 8, '03	B.C.L.S.
Griffin, Albert Dyke.....	Elk Lake, Ont.....	Dec. 14, '60	May 13, '13	O.L.S.
Grover, George Alexander.....	Toronto, Ont.....		Feb. 18, '04	
Haggen, Rupert Williams.....	Quesnel, B.C.....	July 29, '87	May 18, '11	B.C.L.S.
Hamilton, Charles Thomas.....	Vancouver, B. C.....	July 29, '84	May 18, '11	B.C.L.S.
Hamilton, James Frederick.....	Lethbridge, Alta.....	April 4, '69	June 2, '09	A.L.S.
Harris, John Walter.....	Winnipeg, Man.....	Feb. 26, '45	April 14, '72	O.L.S., M.L.S., Assessment Commissioner and City Surveyor.
Harrison, Edward.....	Calgary, Alta.....		May 14, '10	A.L.S.
Harvey, Charles.....	Kelowna, B.C.....	May 5, '76	Feb. 17, '04	B.C.L.S.
Hawkins, Albert Howard.....	Listowel, Ont.....	July 27, '62	Mar. 6, '06	
Heaman, John Andrew.....	Winnipeg, Man.....	June 3, '75	July 15, '09	O.L.S.
Heathcott, Robert Vernon.....	Edmonton, Alta.....	July 7, '81	May 13, '07	A.L.S.
Henderson, Walter.....	Not known.....		Nov. 17, '83	
Hermion, Ernest Bolton.....	Vancouver, B.C.....		June 22, '85	
Herriot, George Henry.....	Souris, Man.....	Feb. 23, '83	Sept. 18, '09	M.L.S.
Heuperman, Frederick Justinus.....	Calgary, Alta.....	July 23, '87	Mar. 13, '11	A.L.S.
Heuperman, Lambertus Fred.....	Calgary, Alta.....	Sept. 20, '81	Mar. 29, '10	A.L.S.
Hoar, Charles Millard.....	Calgary, Alta.....	Sept. 26, '85	Mar. 9, '11	A.L.S.
Hobbs, Wilfrid Ernest.....	Winnipeg, Man.....	Mar. 12, '87	Mar. 5, '12	M.L.S.



## APPENDIX No. 9—Continued.

LIST of Dominion Land Surveyors who are in possession of Standard Measures.—  
Continued.

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Holcroft, Herbert Spencer . . .	Toronto, Ont. . . . .	Sept. 4, '77	Feb. 18, '03	O.L.S.
Hopkins, Marshall Willard . . .	Edmonton, Alta . . . .	May 24, '61	Feb. 20, '01	O.L.S., A.L.S.
Hubbell, Ernest Wilson . . . . .	Ottawa, Ont. . . . .	Nov. 5, '62	May 19, '84	Chief Inspector of Surveys, Dept. of the Interior.
Inkster, Oluff . . . . .	Edmonton, Alta. . . . .	Mar. 25, '85	May 18, '11	A.L.S.
Jackson, John Edwin . . . . .	Hamilton, Ont. . . . .	Dec. 27, '81	May 18, '11	O.L.S.
James, Silas . . . . .	Toronto, Ont. . . . .	June 19, '34	Apr. 14, '72	O.L.S.
Jephson, Richard Jermy . . . . .	Brandon, Man. . . . .	Feb. 5, '34	May 12, '80	O.L.S., B.C.L.S., M.L.S.
Johnson, Alfred William . . . . .	Kamloops, B.C. . . . .	Feb. 23, '74	Mar. 12, '02	B.C.L.S.
Johnston, Percy Nowell . . . . .	Edmonton, Alta. . . . .	Oct. 4, '75	May 10, '09	
Johnston, James Homer . . . . .	Edmonton, Alta. . . . .	Aug. 23, '87	May 17, '12	A.L.S.
Johnston, William James . . . . .	St. Catharines, Ont. . . .	Jan. 31, '81	Mar. 11, '11	
Keith, Homer Pasha . . . . .	Edmonton, Alta. . . . .	Aug. 30, '85	Feb. 1, '11	A.L.S.
Kimpe, Maurice . . . . .	Edmonton, Alta. . . . .	Jan. 17, '76	May 13, '07	A.L.S.
King, William Frederick . . . . .	Dominion Observatory, Ottawa, Ont.	Feb. 19, '54	Nov. 21, '76	D.T.S. Chief Astronomer, Dept. of the Interior.
Kirk, John Albert . . . . .	Summerland, B.C. . . . .	Jan. 9, '54	May 11, '80	O.L.S., B.C.L.S.
Kitto, Franklin Hugo . . . . .	Ottawa, Ont. . . . .	Mar. 28, '80	Mar. 6, '08	Mining Lands and Yukon Br., Dept. of Interior.
Klotz, Otto Julius . . . . .	Dominion Observatory, Ottawa, Ont.	Mar. 31, '52	Nov. 19, '77	O.L.S., D.T.S., Astronomer, Dept. of Interior.
Knight, Richard H. . . . .	Edmonton, Alta. . . . .	June 7, '77	Feb. 18, '64	A.L.S.
Lamb, Frederick Carlyle . . . . .	Saskatoon, Sask. . . . .	Dec. 11, '88	May 17, '12	
Lang, John Leiper . . . . .	Sault Ste Marie, Ont. . . .	Aug. 18, '84	Oct. 14, '08	O.L.S.
Latimer, Frank Herbert . . . . .	Penticton, B.C. . . . .	May 23, '60	Nov. 13, '85	B.C.L.S.
Laurie, Richard C. . . . .	Battleford, Sask. . . . .	Jan. 31, '58	April 27, '83	S.L.S.
Leblanc, Pierre Maxime Henri . . .	Ottawa, Ont. . . . .	Oct. 1, '84	May 13, '13	
Lee, Roger Melville . . . . .	Saskatoon, Sask. . . . .	—	May 11, '11	O.L.S.
Lemoine, Charles Errol . . . . .	Ville Montcalm, P.Q. . . . .	—	Mar. 31, '82	Q.L.S.
Lighthall, Abram . . . . .	Vancouver, B.C. . . . .	Mar. 30, '78	Dec. 25, '09	
Lindsay, James Herbert . . . . .	Prince Albert, Sask. . . . .	Nov. 27, '82	May 18, '11	S.L.S.
Loneragan, Gerald Joseph . . . . .	Buckingham, P.Q. . . . .	Oct. 8, '71	Feb. 28, '01	Q.L.S., A.L.S., Inspector of Surveys, Dept. of Interior.
Loucks, Roy Wm. Egbert . . . . .	Saskatoon, Sask. . . . .	Oct. 31, '84	Mar. 1, '12	A.L.S., S.L.S.
Lumsden, Hugh David . . . . .	St. Andrews, N.B. . . . .	Sept. 7, '44	April 14, '72	O.L.S.
Macdonald, Colin Stone . . . . .	Ottawa, Ont. . . . .	May 26, '87	Mar. 10, '14	
Macdonald, Gordon Alexander . . .	Muirkirk, Ont. . . . .	May 24, '85	May 17, '12	B.C.L.S.
MacLennan, Alexander L. . . . .	Toronto, Ont. . . . .	May 10, '78	Feb. 23, '05	S.L.S.
MacLeod, George Waters . . . . .	Edmonton, Alta. . . . .	—	Mar. 1, '12	A.L.S.
MacPherson, Charles Wilfrid . . . .	Dawson, Y.T. . . . .	Sept. 6, '71	Mar. 7, '00	O.L.S.
Magrath, Charles Alexander . . . .	Ottawa, Ont. . . . .	April 22, '60	Nov. 16, '81	O.L.S., B.C.L.S., D.T.S. Member International Waterways Commission.
Martindale, Ernest Smith . . . . .	Kingsmill, Ont. . . . .	May 26, '86	Mar. 11, '11	
Martyn, Oscar William . . . . .	Regina, Sask. . . . .	Dec. 2, '88	Mar. 11, '11	S.L.S.
Matheson, Hugh . . . . .	Ottawa, Ont. . . . .	May 2, '79	May 9, '11	
McArthur, James Joseph . . . . .	Ottawa, Ont. . . . .	May 9, '56	April 17, '79	Boundary Surveys, Dept. of Interior.
McCaw, Robert Daniel . . . . .	Sidney, B.C. . . . .	May 24, '83	Mar. 23, '09	O.L.S., B.C.L.S., A.L.S.
McColl, Gilbert Beebe . . . . .	Winnipeg, Man. . . . .	Oct. 8, '82	Mar. 20, '07	M.L.S., D.T.S.
McCall, Samuel Ebenezer . . . . .	Winnipeg, Man. . . . .	July 17, '86	May 18, '11	M.L.S.
McDiarmid, Stuart Stanley . . . . .	Vancouver, B.C. . . . .	Aug. 4, '81	Feb. 23, '05	B.C.L.S.
McDonald, Harold French . . . . .	Winnipeg, Man. . . . .	Nov. 22, '85	Mar. 3, '13	M.L.S., S.L.S., A.L.S.
McElhanney, Thomas Andrew . . . .	Vancouver, B.C. . . . .	April 21, '86	Mar. 17, '12	
McElhanney, William Gordon . . . .	Vancouver, B.C. . . . .	Mar. 10, '77	Jan. 7, '11	
McEwen, Duncan Findlay . . . . .	Edmonton, Alta. . . . .	Aug. 7, '76	May 18, '11	A.L.S.
McFadden, Moses . . . . .	Vancouver, B.C. . . . .	Aug. 26, '26	April 14, '72	O.L.S., M.L.S.



SESSIONAL PAPER No. 25b

APPENDIX No. 9—*Continued.*

LIST of Dominion Land Surveyors who are in possession of Standard Measures.—  
*Continued.*

Name.	Address.	Date of Birth	Date of Appointment or of Commission.	Remarks.
McFarlane, Walter Graham..	Peace River Cross- ing, Alta. ....	Sept. 28, '75	May 19, '05	A.L.S.
McFarlane, John Baird.....	Toronto, Ont. ....	Feb. 25, '79	June 3, '08	A.L.S.
McFee, Angus.....	Red Deer, Alta. ....	July 14, '46	April 19, '79	A.L.S.
McGeorge, William Graham..	Chatham, Ont. ....	Mar. 22, '87	Mar. 31, '10	O.L.S.
McGrandle, Hugh.....	Wetaskiwin, Alta. ....	Mar. 12, '57	Mar. 30, '83	O.L.S., A.L.S.
McKay, Robert B.....	Vancouver, B.C. ....	April 21, '83	May 21, '12	
McKnight, James Henry.....	Simcoe, Ont. ....	July 13, '85	May 13, '13	
McLellan, Roy Alexander.....	Toronto, Ont. ....	July 31, '89	Mar. 15, '13	
McMaster, William Angus Alexander.....	Prince Albert, Sask. ....	Feb. 1, '85	July 6, '10	A.L.S., S.L.S.
McMillan, George.....	Calgary, Alta. ....	Dec. 9, '69	Feb. 22, '06	
McNaughton, Alexander L.....	Kelowna, B.C. ....	Sept. 30, '81	Feb. 23, '05	O.L.S., B.C.L.S.
McPherson, Archibald John.....	Regina, Sask. ....	—, '70	Feb. 21, '01	S.L.S.
McPhillips, Robert Charles.....	Winnipeg, Man. ....	April 24, '56	May 17, '80	M.L.S.
McVittie, Archibald W.....	Victoria, B.C. ....	May 5, '58	Mar. 30, '82	B.C.L.S.
Meadows, William Walter ..	Maple Creek, Sask. ....	May 27, '73	Feb. 23, '05	O.L.S., S.L.S.
Melhuish, Paul.....	Vancouver, B.C. ....	April 14, '87	May 18, '11	B.C.L.S.
Miles, Charles Falconer.....	Toronto, Ont. ....	Jan. 30, '38	April 14, '72	O.L.S., Inspector of Sur- veys, Dept. of Interior.
Mitchell, Benjamin Foster.....	Edmonton, Alta. ....	June 16, '80	April 16, '08	A.L.S.
Moberly, Harford Kenneth.....	Yorkton, Sask. ....	—, '69	April 21, '03	S.L.S.
Montgomery, Royal Harp.....	Prince Albert, Sask. ....	May 20, '82	Feb. 23, '05	O.L.S., S.L.S.
Moore, Herbert Harrison.....	Calgary, Alta. ....	Dec. 1, '69	Feb. 17, '04	A.L.S.
Morrier, Joseph Eldedge.....	Prince Albert, Sask. ....	Aug. 29, '74	May 16, '07	S.L.S.
Murray, Ernest William.....	Regina, Sask. ....	Mar. 20, '84	May 31, '10	S.L.S.
Narraway, Athos Maxwell.....	Ottawa, Ont. ....	July 19, '88	May 18, '11	
Neelands, Rupert A.....	Hamiota, Man. ....	Aug. 26, '84	Mar. 5, '12	
Nelles, Douglas Henry.....	Ottawa, Ont. ....	Mar. 26, '81	Mar. 9, '07	Geodetic Surveys, Dept. of the Interior.
Nesham, Edward Williams.....	Ottawa, Ont. ....	June 10, '88	Mar. 15, '13	Geodetic Surveys, Dept. of the Interior.
Neville, Everett A.....	Vancouver, B.C. ....	Jan. 8, '87	May 18, '11	B.C.L.S.
Norrish, William Henry.....	Ottawa, Ont. ....	May 10, '92	May 13, '14	
O'Hara, Walter Francis.....	Ottawa, Ont. ....	Mar. 31, '69	Feb. 19, '95	O.L.S.
Ord, Lewis Redman.....	Hamilton, Ont. ....	Oct. 17, '56	April 1, '82	O.L.S.
Palmer, Philip Ebenezer.....	Dorchester, N.B. ....	May 6, '88	Mar. 7, '12	
Parsons, Johnstone Lindsay R.	Regina, Sask. ....	Jan. 18, '76	Feb. 23, '05	O.L.S., S.L.S.
Patrick, Allan Poyntz.....	Calgary, Alta. ....	July 18, '49	Nov. 19, '77	B.C.L.S., D.T.S., A.L.S.
Patten, Thaddeus James.....	Little Current, Ont. ....	Feb. 4, '59	Mar. 29, '83	O.L.S.
Pearce, William.....	Calgary, Alta. ....	Feb. 1, '48	May 10, '80	O.L.S., B.C.L.S., A.L.S.
Pearce, Seabury Kains.....	Calgary, Alta. ....	Dec. 6, '87	Mar. 9, '11	A.L.S.
Pearson, Hugh Edward.....	Edmonton, Alta. ....	Oct. 17, '87	May 17, '12	A.L.S.
Pequegnat, Marcel.....	Berlin, Ont. ....	April 27, '86	June 6, '10	O.L.S.
Peters, Frederic Hatheway.....	Calgary, Alta. ....	Nov. 4, '83	Mar. 4, '10	A.L.S., Com. of Irrigation
Phillips, Edward Horace.....	Saskatoon, Sask. ....	Dec. 19, '78	Feb. 21, '02	S.L.S.
Phillips, Harold Geoffrey.....	Regina, Sask. ....	Sept. 3, '87	April 23, '10	S.L.S.
Pierce, Benjamin Clifford.....	Kingston, Ont. ....	Nov. 5, '90	Mar. 13, '14	
Pierce, John Wesley.....	Ottawa, Ont. ....	July 14, '85	Dec. 24, '09	O.L.S.
Pinder, George Zouch.....	Edmonton, Alta. ....	Mar. 5, '81	Mar. 15, '13	
Plunkett, Thomas Hartley.....	Meaford, Ont. ....	June 1, '78	Mar. 12, '08	
Powell, William Henry.....	Vancouver, B.C. ....	Dec. 22, '84	Feb. 22, '11	B.C.L.S.
Proudfoot, Hume Blake.....	Prince Albert, Sask. ....	June 23, '58	Mar. 28, '82	O.L.S., S.L.S.
Purser, Ralph Clinton.....	Windsor, Ont. ....	April 7, '86	Feb. 2, '11	
Rainboth, Edward Joseph.....	Ottawa, Ont. ....	—, '81	May 19, '81	Q.L.S., O.L.S.
Ransom, John Thomas.....	Toronto, Ont. ....	Aug. 24, '88	Jan. 14, '11	O.L.S.
Reilly, William Robinson.....	Regina, Sask. ....	Aug. 10, '57	Nov. 17, '81	O.L.S., M.L.S., S.L.S.
Richard, Joseph Francois.....	Ste. Anne de la Po- catière, P.Q. ....	—, '82	May 13, '82	Q.L.S.
Rinfret, Claude.....	Montreal, P.Q. ....	Jan. 5, '86	Mar. 20, '08	Q.L.S.
Rinfret, Raoul.....	Montreal, P.Q. ....	July 16, '56	Feb. 20, '00	Q.L.S.



## APPENDIX No. 9—Continued.

LIST of Dominion Land Surveyors who are in possession of Standard Measures.—  
Continued.

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Ritchie, Joseph Frederick. ....	Prince Rupert, B.C.	May 23, '63	Jan. 7, '89	B.C.L.S.
Roberts, Otto Beer. ....	Kingston, Ont. ....	Oct. 19, '87	May 13, '14	
Roberts, Sydney Archibald. ....	Victoria, B.C. ....	April 10, '48	May 16, '85	B.C.L.S.
Roberts, Vaughan Maurice. ....	Goderich, Ont. ....	Mar. 22, '64	May 17, '86	
Robertson, Donald Fraser. ....	Ottawa, Ont. ....	Sept. 30, '80	May 25, '69	Dept. of Ind. and Affairs.
Robertson, Henry H. ....	N. Timiskaming, P.Q.	Sept. 13, '47	April 14, '72	Q.L.S.
Robertson, Edgar Doctor. ....	Edmonton, Alta. ....	Sept. 12, '85	Mar. 15, '13	
Robinson, Ernest Walter P. ....	Ottawa, Ont. ....	May 8, '80	May 1, '08	
Robinson, Franklin Joseph. ....	Regina, Sask. ....	Oct. 20, '70	Feb. 20, '00	S.L.S., Chairman of Board of Highway Commissioners.
Robinson, William Andrew. ....	Winnipeg, Man. ....	Feb. 21, '81	Oct. 2, '11	S.L.S., M.L.S.
Rolfson, Orville. ....	Walkerville, Ont. ....	Feb. 26, '85	July 11, '08	
Rombough, Marshall Bedwell. ....	Morden, Man. ....	Oct. 14, '35	April 14, '72	M.L.S.
Rorke, Louis Valentine. ....	Toronto, Ont. ....	Feb. — '65	Aug. 13, '91	O.L.S., Inspector of Surveys for Ontario.
Ross, George. ....	Welland, Ont. ....	June 12, '53	Nov. 21, '82	O.L.S.
Ross, Joseph Edmund. ....	Kamloops, B.C. ....	Jan. 9, '61	Feb. 12, '91	O.L.S., B.C.L.S.
Routly, Herbert Thomas. ....	Toronto, Ont. ....	Jan. 20, '78	Feb. 15, '11	O.L.S.
Roy, George Peter. ....	Quebec, P.Q. ....	Oct. 1, '52	Nov. 17, '81	Q.L.S.
Roy, Joseph George Emile. ....	Quebec, P.Q. ....	Mar. 14, '86	May 25, '10	Q.L.S.
Russell, Alexander Lord. ....	Port Arthur, Ont. ....		April 14, '72	O.L.S.
Saint Cyr, Jean Baptiste. ....	Montreal, P.Q. ....	Dec. 17, '66	Feb. 17, '87	Q.L.S.
Saint Cyr, Arthur. ....	Ottawa, Ont. ....	Nov. — '66	Feb. 17, '87	
Saunders, Bryce Johnston. ....	Edmonton, Alta. ....	Oct. 17, '60	Nov. 16, '84	O.L.S.
Scott, Walter Alexander. ....	Calgary, Alta. ....	Aug. 8, '85	Mar. 9, '09	A.L.S., S.L.S.
Seager, Edmund. ....	Kenora, Ont. ....	Nov. 22, '38	April 14, '72	O.L.S.
Segré, Beresford Henry. ....	Davidson, Sask. ....	Feb. 19, '86	May 8, '12	
Seibert, Frederick V. ....	Edmonton, Alta. ....	Nov. 5, '85	Mar. 11, '11	O.L.S., S.L.S.
Sewell, Henry DeQuincy. ....	Toronto, Ont. ....	April 18, '48	May 16, '85	O.L.S.
Seymour, Horace Llewellyn. ....	Ottawa, Ont. ....	June 11, '82	Feb. 22, '06	O.L.S., A.L.S., S.L.S., T.S. Branch Dept. of the Interior.
Shaver, Peter Albert. ....	Calgary, Alta. ....	Sept. 24, '69	May 18, '14	
Shaw, Charles Aneas. ....	Greenwood, B.C. ....	Nov. 16, '53	May 10, '80	O.L.S., B.C.L.S.
Shepley, Joseph Drummond. ....	N. Battleford, Sask. ....	Sept. 13, '79	Mar. 12, '06	S.L.S.
Smith, Charles Campbell. ....	Vancouver, B.C. ....	Jan. 1, '73	Feb. 22, '06	O.L.S.
Smith, Donald Alpine. ....	Regina, Sask. ....	Sept. 22, '80	April 21, '10	S.L.S.
Smith, James Herbert. ....	Edmonton, Alta. ....	Nov. 9, '76	Feb. 23, '05	A.L.S., O.L.S.
Soars, Henry Martin Robinson. ....	Edmonton, Alta. ....	April 22, '77	Nov. 2, '08	A.L.S.
Speight, Thomas Bailey. ....	Toronto, Ont. ....	Feb. 8, '59	Nov. 16, '82	O.L.S.
Starkey, Samuel M. ....	Cody, N.E. ....	Sept. 4, '37	April 14, '72	P.L.S. for N.B.
Steele, Ira John. ....	Ottawa, Ont. ....	April 6, '81	April 16, '08	O.L.S., S.L.S.
Stewart, Elihu. ....	Collingwood, Ont. ....	Nov. 17, '44	April 14, '72	O.L.S.
Stewart, Lionel Douglas N. ....	Fort Frances, Ont. ....	Sept. 15, '33	Jan. 27, '10	O.L.S.
Stewart, Will Malcolm. ....	Saskatoon, Sask. ....	Nov. 26, '84	June 6, '07	S.L.S.
Stewart, Louis Beaufort. ....	Toronto, Ont. ....	Jan. 27, '61	Nov. 22, '82	O.L.S., D.T.S. Professor of Surveying and Geodesy, University, of Toronto.
Stewart, Alexander George. ....	Edmonton, Alta. ....	Aug. 16, '87	Mar. 14, '10	A.L.S.
Stewart, Alexander Stanley. ....	Lacombe, Alta. ....		June 13, '08	
Stewart, George Alexander. ....			April 14, '72	O.L.S.
Stewart, Norman C. ....	Vancouver, B.C. ....	Jan. 9, '85	Mar. 7, '12	B.C.L.S.
Stock, James Joseph. ....	Ottawa, Ont. ....	Aug. 16, '87	Mar. 2, '10	
Street, Paul Bishop. ....	Toronto, Ont. ....	Dec. 3, '81	Mar. 29, '10	
Stuart, Alexander Graham. ....	Buckingham, P.Q. ....	July 16, '88	May 9, '11	
Summers, Gordon Foster. ....	Haileybury, Ont. ....		Oct. 20, '10	O.L.S.
Swannell, Frank Cyril. ....	Victoria, B.C. ....		May 10, '04	B.C.L.S.
Taggart, Charles Henry. ....	Kamloops, B.C. ....		May 9, '11	



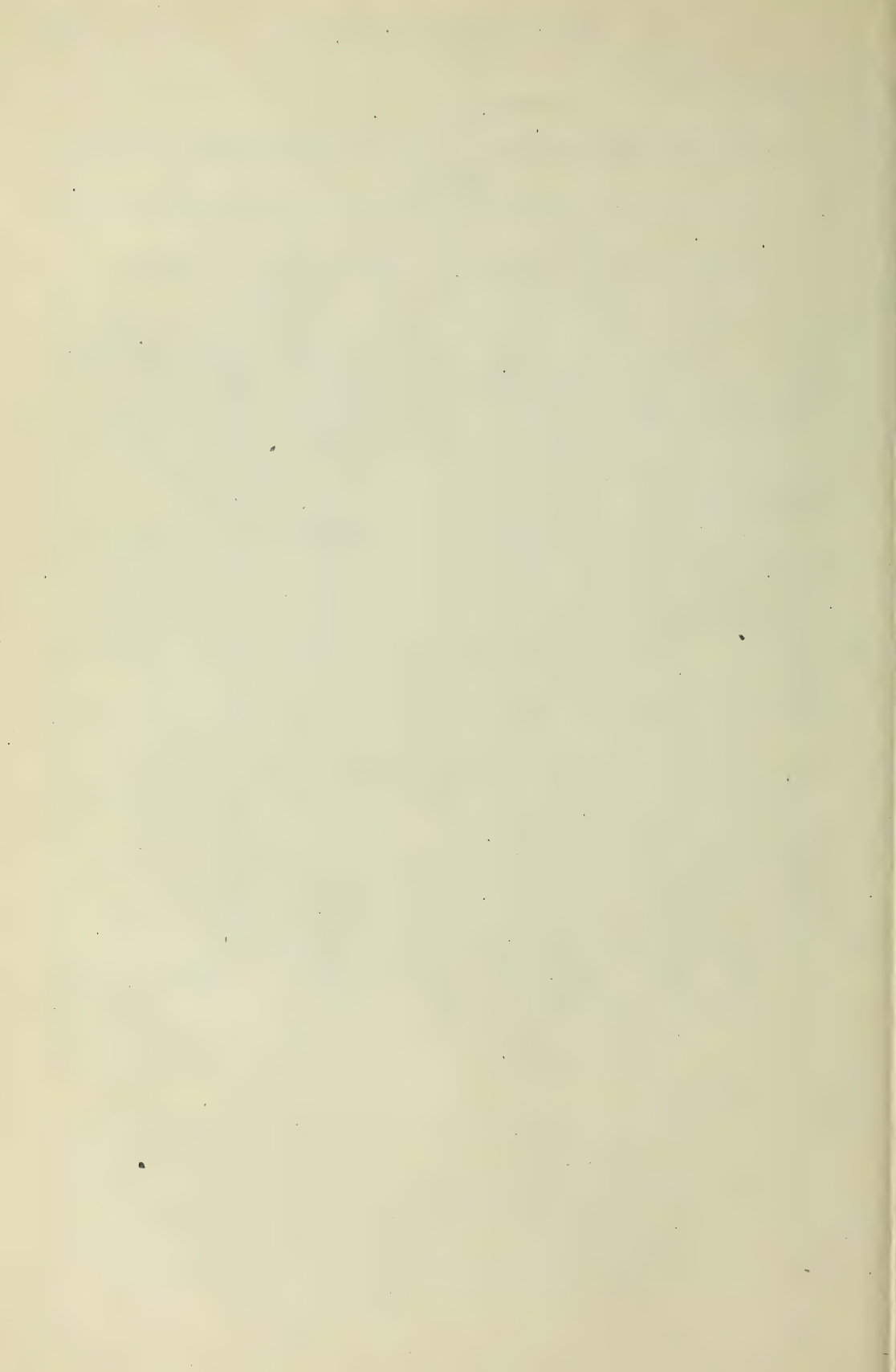
## SESSIONAL PAPER No. 25b

APPENDIX No. 9—*Concluded.*

LIST of Dominion Land Surveyors who are in possession of Standard Measures.—  
*Concluded.*

Name.	Address.	Date of Birth.	Date of Appointment or of Commission.	Remarks.
Talbot, Albert Charles.....	Calgary, Alta .....	April 5, '56	May 13, '80	A.L.S., Surveyor Land Titles Office.
Taylor, Alexander .....	Portage la Prairie, M.	Aug. 6, '75	June 9, '04	M.L.S., S.L.S.
Taylor, William Emerson.....	Toronto, Ont. ....	Aug. 3, '81	Dec. 16, '10	O.L.S.
Teasdale, Charles Montgomery	Moosejaw, Sask. ....	Oct. 18, '79	Mar. 9, '06	S.L.S.
Thompson, William Thomas...	Grenfell, Sask. ....	Nov. 1, '53	Nov. 19, '77	D.T.S., S.L.S.
Tipper, George Adrian.....	Brantford, Ont. ....	July 25, '86	May 18, '11	A.L.S.
Townsend, David Thomas.....	Calgary, Alta. ....	.....	Mar. 23, '07	O.L.S.
Tracy, Thomas Henry .....	Vancouver, B.C. ....	June 25, '48	April 14, '72	O.L.S., B.C.L.S.
Tremblay, Alfred Joseph.....	Montreal, P.Q. ....	.....	Feb. 18, '90	.....
Tremblay, Albert Jacques.....	Edmonton, Alta. ....	July 25, '87	Mar. 1, '12	A.L.S.
Turnbull, Thomas .....	Winnipeg, Man. ....	May 26, '57	Mar. 29, '82	O.L.S.
Tyrrell, James William.....	Hamilton, Ont. ....	May 10, '63	Feb. 16, '87	O.L.S.
Underwood, Joseph Edwin.....	Saskatoon, Sask. ....	Nov. 3, '82	May 18, '11	S.L.S.
Van Skiver, Leighton A. ....	Fish Lake, Ont. ....	.....	May 13, '13	.....
Vaughan, Josephus Wyatt.....	Vancouver, B.C. ....	Oct. 17, '45	June 11, '78	B.C.L.S.
Vicars, John Richard Odium...	Kamloops, B.C. ....	April 16, '55	May 17, '86	O.L.S., B.C.L.S.
Vickers, Thomas Newell.....	N. Battleford, Sask.	April 19, '90	May 17, '12	S.L.S.
Von Edeskyty, Joseph Otto...	Vancouver, B.C. ....	Oct. 27, '84	Mar. 3, '13	.....
Waddell, William Henry.....	Edmonton, Alta. ....	Mar. 23, '83	Mar. 25, '07	O.L.S., A.L.S.
Waldron, John.....	Moosejaw, Sask. ....	Aug. 1, '72	April 2, '07	S.L.S.
Walker, Claude Melville.....	Guelph, Ont. ....	Oct. 16, '84	Mar. 11, '11	.....
Wallace, James Nevin.....	Calgary, Alta. ....	Aug. 21, '70	Feb. 20, '00	O.L.S., A.L.S.
Warren, James.....	Walkerton, Ont. ....	Nov. 7, '37	April 14, '72	O.L.S.
Warrington, George Albert...	Winnipeg, Man. ....	.....	Mar. 15, '13	M.L.S.
Watt, George Herbert.....	Ottawa, Ont. ....	Feb. 5, '76	Feb. 24, '02	T.S. Branch Dept. of Interior.
Waugh, Bruce Wallace. ....	Ottawa, Ont. ....	Mar. 24, '88	May 23, '12	.....
Weekes, Abel Seneca.....	Edmonton, Alta. ....	Feb. 17, '66	Feb. 11, '92	A.L.S., S.L.S., O.L.S.
Weekes, Melville Bell.....	Regina, Sask. ....	Nov. 28, '74	Feb. 18, '03	O.L.S., S.L.S.
Wheeler, Arthur Oliver.....	Sidney, B.C. ....	May 1, '60	Nov. 21, '82	O.L.S., B.C.L.S.
White-Fraser, George W.R.M.	Victoria, B.C. ....	.....	'61	M.L.S., A.L.S.
Wiggins, Thomas Henry.....	Saskatoon, Sask. ....	Aug. 24, '63	Feb. 18, '96	D.T.S., B.C.L.S.
Wilkins, Frederick W. B. ....	Norwood, Ont. ....	June 27, '54	May 18, '81	O.L.S., S.L.S.
Wilkinson, William Downing	Hamilton, Bermuda.	Mar. 22, '64	Feb. 22, '93	O.L.S., D.T.S.
Williams, Guy Lorne.....	Enderby, B.C. ....	Mar. 3, '79	June 24, '08	B.C.L.S.
Wilson, Reginald Palliser. ....	Winnipeg, Man. ....	July 9, '72	Jan. 26, '11	M.L.S.
Woods, Joseph Edward.....	Pincher Creek, Alta.	Oct. 13, '61	Nov. 14, '85	A.L.S.
Wrong, Frederick Hay.....	Windsor, Ont. ....	Aug. 22, '86	May 18, '11	.....
Young, Stewart.....	Regina, Sask. ....	Sept. 2, '84	May 17, '13	S.L.S.
Young, Walter Beatty.....	Winnipeg, Man. ....	July 6, '80	Mar. 25, '05	M.L.S.
Young, William Howard.....	Calgary, Alta. ....	June 8, '78	May 17, '07	A.L.S. District Engineer.







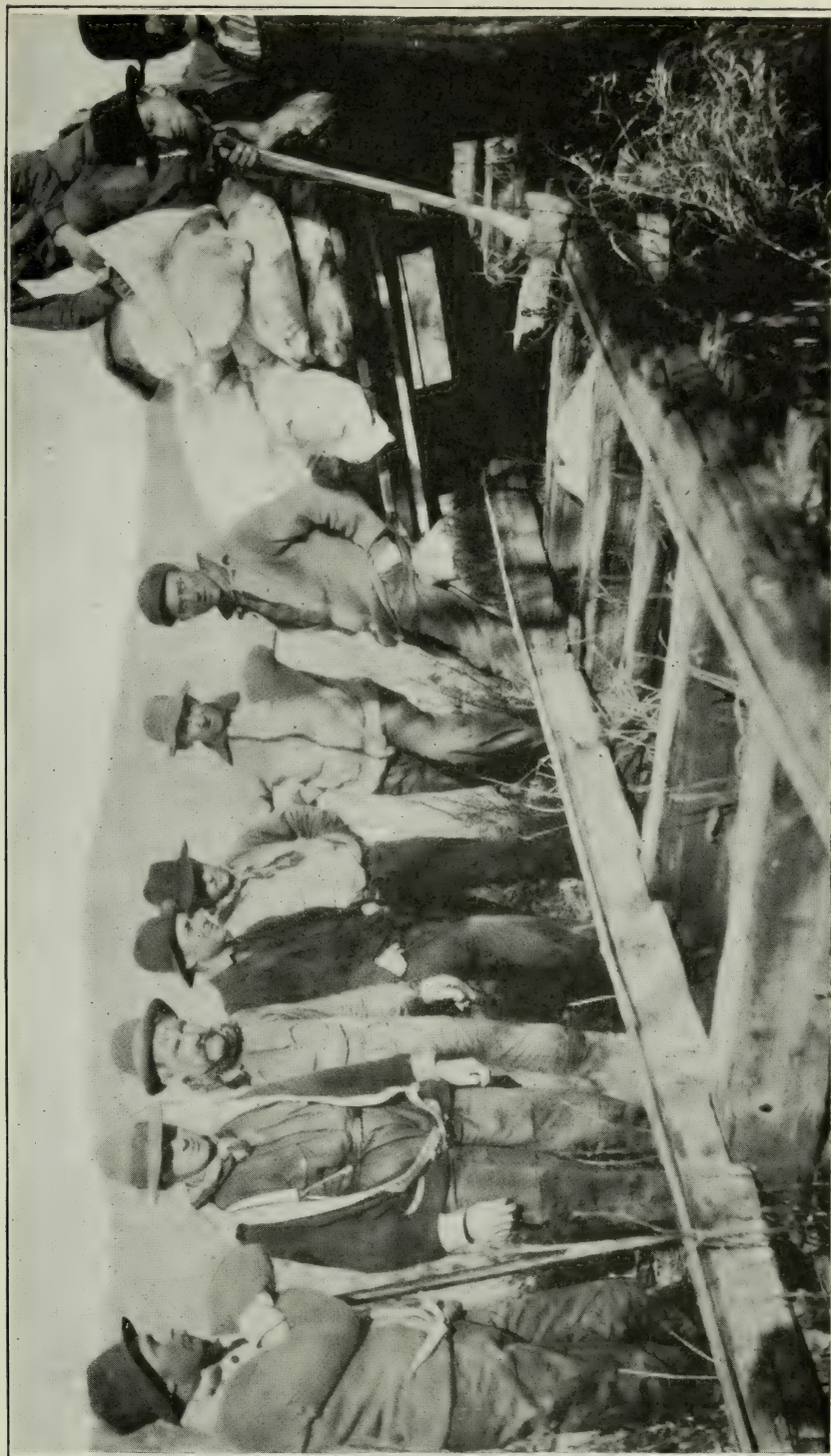


Photo by F. V. SEIBERT, D.L.S.

# WRECK ON GRAND ISLAND TRAMWAY—ATHABASKA RIVER.

The mode of transportation on the Athabaska river is illustrated by this and the following views. Scows are built at Athabaska during the winter, loaded after the ice breaks up and floated down the river. Some of the rapids can be run without unloading, but at Grand Rapids it is necessary to unload. A tramway, 2,000 feet long, consisting of spruce stringers with a light iron band on top, was built on Grand Island in 1894 by the Hudson's Bay Company who charge \$2.50 per ton of freight for the use of the two push cars. Accidents as shown are frequent although the company place a man on the island to keep the track in repair and collect dues







# REPORTS OF SURVEYORS







## GENERAL REPORTS OF SURVEYORS

1914-1915

## APPENDIX No. 10.

## ABSTRACT OF THE REPORT OF J. R. AKINS, D.L.S.

## SURVEY OF THE 29TH BASE LINE BETWEEN THE FIFTH AND SIXTH MERIDIANS.

The survey of the base line was begun at its intersection with the Fifth meridian, about sixty miles northeast of Red River settlement, and was continued westward striking the Sixth meridian about eighty miles northwest of Fort Vermilion.

I left Edmonton with my party on April 8, 1914, and travelled by the Edmonton, Dunvegan and British Columbia railway to the east end of Lesser Slave lake, where we arrived on the 10th. There by previous arrangement we were met by teams belonging to Revillon Bros., and the outfit was taken over the ice on Lesser Slave lake to Grouard.

From there on to Peace River Crossing the trail was reported to be so bad that we had difficulty in securing teams for transportation. However a sufficient number were finally secured, and, although we found the trail in worse condition than was anticipated, we were able to reach the Crossing on April 20.

At this place we found the river open, but as drift ice was still running we were delayed a few days.

Scows, carrying about twelve tons each, which had been ordered the previous fall, were loaded on April 24, and the trip down the river was begun the following day. At Fort Vermilion, which was reached on the 30th, we were still further delayed by the drift ice, the river at this point having broken up only the day before.

The trip down Peace river was continued on May 2, and Vermilion rapids, fifty miles below Fort Vermilion, were reached the following day. These rapids extend over a distance of about thirty chains. Below this the water is smooth as far as Vermilion "chutes," a distance of three or four miles, where a drop of ten or twelve feet occurs. A party was employed during the summer of 1914 in surveying a route for a tramway around these "chutes." If this tramway and the railway to Peace River Crossing were completed all the freight for the Mackenzie basin would go down Peace river.

We experienced a great deal of difficulty at the 'chutes,' as the channel close to the south shore, where scows are usually let down with ropes, was jammed full of ice, reaching in places a height of thirty feet; we finally succeeded in forcing a passage near the north bank of the river. The scows were unloaded and run down empty, the loads being portaged both at the rapids and at the "chutes."

We reached Red River settlement on May 8, and the point where Peace river crosses the Fifth meridian on the following day. From this place a trail was cut a distance of fifteen miles to our starting point on the 29th base line. Work on the line was begun on May 16.

In range 4 Deer river was crossed. South and east of this river as far as the Peace the soil is good, the surface being gently rolling and wooded with poplar and spruce. West of the river the country rises quickly towards Caribou mountains, the summit being reached in range 5. The slope is heavily wooded with spruce and jack-pine up to twelve inches in diameter, and the top lightly wooded with stunted spruce and covered with moss. The frost remains in the ground throughout the year, the



surface moss thawing only to a depth of about six inches. The roots of the trees do not grow deep into the ground, and are very easily pulled out during the warm weather.

Caribou mountains are of little value except as a game preserve, but if the surface moss were burned off they might produce good grazing, as bunch grass was found where a fire ran two years ago. A number of lakes are found on the plateau-like top of the mountains, but no grass grows around them as the moss extends right to the water's edge.

The part of the mountain crossed by the base line appears to be of moraine formation, as no exposures of rock were seen. The banks of the river and streams are composed of clay and gravel, and the beds are full of boulders of an igneous character. These boulders probably had their origin in the igneous rocks east of Great Slave lake, and were transported to their present location by the great glacier which came from the northeast and whose action is plainly seen in the striated rocks east of Slave river. As the Caribou mountains form quite a large physical feature, it is not likely that they were entirely formed by a moraine. Originally there may have been an elevation which interfered with the flow of the glacier and caused the deposits. The rocks under the clay and boulders are probably Devonian limestone.

After running along the top of the mountains for about forty miles, the base line begins to descend about the middle of range 11, where it crosses Carl creek. As this district has been overrun by fire, wild rye grass grows in abundance, and furnished the first horse feed found after leaving range 5.

The mountains run northwesterly from Carl creek, and the district to the south and west is nearly level or gently rolling. This district was formerly well wooded, but was overrun with fire as far as the middle of range 17; it is now covered with grass and the soil is good.

Boyer river in range 13, is about one hundred and sixty feet wide, two to four feet deep and flows five miles an hour. It has very deep cut banks; the valley is about sixty chains wide.

From range 17 to range 21 the line runs through light timber which is of small value, except for settlers' use. The trail from Hay River trading post to Fort Vermilion crosses the line in range 21. South of the base line to Fort Vermilion the trail is good; but towards Hay river it is very stony.

The district crossed by the line from Hay River trail to the Sixth meridian is lightly wooded with poplar, willow and spruce, with plenty of horse feed.

The Sixth meridian was reached on September 17, and the following day the party left for Fort Vermilion, where we arrived in time to catch the last boat to Peace River Crossing.

In the Caribou mountains bears and caribou abound. A few moose were seen on the lower country, but they are not plentiful. Feathered game is scarce owing to the presence of so many of the fur-bearing animals that prey upon them, such as foxes, mink, marten, fisher, otter and ermine. Beavers are not plentiful though some were seen.

The lakes on the mountains abound with fish, but the fishing industry is neglected, as hunting and trapping is more lucrative. For the same reason the cultivation of the valuable land around Fort Vermilion is neglected.

Fort Vermilion can be reached from Peace River Crossing by boat or raft, down Peace river, or by a pack-trail which runs to the west of the river, crosses Notikewin, Keg, Prairie and Boyer rivers and passes near Bear lake. The trail is not very good in places and does not follow the river, being sometimes forty miles from it. The trip from Peace River Crossing to Fort Vermilion by trail would require about ten days for a man on horseback.

A wagon road in the vicinity of the pack-trail would greatly aid the development of the country as nearly all the land in the valley of Peace and Hay rivers is well suited for farming, and can be easily cleared.



## APPENDIX No. 11.

## ABSTRACT OF THE REPORT OF C. F. AYLSWORTH, D.L.S.

## RESURVEYS IN MANITOBA.

On May 13 I arrived with my party in tp. 23-5-Pr., where we commenced work for the season; a resurvey was made of that portion of the township around Birch lake. We found this township well settled.

Our next work lay in tp. 22-3-Pr. In this township there is some good timber, and settlers come from as far south as Lake Francis, in tp. 15-3 Pr., to secure building material. Fire has destroyed a large amount of timber and much of the alluvial soil.

On July 23, having completed the work in tp. 22-3-Pr., we moved to Vannes and thence to tp. 20-4-Pr. to traverse a lake in section 4. We then left via Eriksdale for Lac du Bonnet, following a corduroy road along the City of Winnipeg Electric Power line and reaching there on August 10.

Our next work consisted of the resurvey of part of tp. 14-11-E. On the east side of Winnipeg river, which runs through the township, there is a strip of dry land about half a mile wide. East of this lies an impassable tamarack muskeg from which nearly all the merchantable timber has been removed.

Winnipeg river in this township, is about a quarter of a mile wide, with banks about forty feet high; the bed of the river is solid rock covered with boulders, rendering navigation dangerous. Whitemouth river flows into the Winnipeg just north of a waterfall, which occurs in the river south of the south boundary of the township. A natural rock dam which has to be portaged lies across Whitemouth river at its outlet. After traversing both banks of Winnipeg river we left for tp. 12-10-E., arriving there on October 8.

This is a very inferior township for agricultural purposes, as the soil is poor and stony and there are a great many muskegs. It is, nevertheless, being rapidly settled by Galicians.

On November 2, I closed operations for the season and returned to Winnipeg.



## APPENDIX No. 12.

## ABSTRACT OF THE REPORT OF M. H. BAKER, D.L.S.

## RETRACEMENT IN SOUTHERN ALBERTA.

During the first part of the season I was engaged on road surveys in Yoho and Rocky Mountain parks, and later on miscellaneous surveys in southern Saskatchewan and Alberta.

My first work was taking levels on the road from Field to Emerald lake, and on the branch of this road running to the natural bridge. I also surveyed the road from Field up the Yoho valley as far as it was constructed, and the road from Field to Ottertail.

This latter road follows the abandoned grade of the Canadian Pacific railway to within about one mile of Ottertail. From there a new road will have to be constructed.

The road from Field to Hector was surveyed from its junction with the Yoho valley road to where it strikes the old railway grade and thence along the grade far enough to tie to the Dominion Lands system.

In the survey of these roads levels were taken and a traverse made in each case, iron posts being planted at the traverse stations.

The next work was a survey of a lot in tp. 28-18-5, and a restoration survey of the cemetery at Field, B.C.

Completing this work on July 28 I left for Lake Louise to make a survey of the roads from the railway station to Chateau Lake Louise and also to Moraine lake.

The miscellaneous surveys in southern Alberta were commenced on August 20, the first work being the retracement of coal claims in tp. 19-4-5. Crops in the district east of this township were good and the settlers appeared to be prosperous. From Lineham in tp. 19-3-5 westward the country becomes rough, and ranching is followed. In tp. 19-4-5 the surface is heavily timbered. In ranges 2 and 3 oil-derricks were seen, and for miles in every direction the country is staked with oil claims. The coal claims are located in the valley of the south branch of Sheep river in very hilly and wooded country. The seams of coal found appear to be of excellent quality.

On September 1, I moved to tp. 19-7-5 to survey the north boundary of section 4 and the east boundary of section 8. In the latter section valuable coal seams were noticed, and coal companies have erected buildings in connection with mining operations.

After making a small restoration survey in tp. 16-4-5 I went to Wymark, Sask., to erect some monuments in that townsite. The town is newly built and some of the buildings are of a very good type. This season, however, has not been favourable to the surrounding country and the town has received a set-back in consequence.

I next went to tp. 1-4-4 to make a traverse of Milk river in section 6, but on reaching there I found that the river had changed its course southerly, and now flows south of the international boundary so that no traverse was required.

The district around Castor, Alberta, where my next work was located, bears the appearance of prosperity. Crops were excellent, and thousands of tons of hay were stacked throughout the district.

North of Medicine Hat, where I also made some miscellaneous resurveys, the crops were a failure owing to lack of moisture. This district seems best suited for ranching and it is to be regretted that farmers are settling there. They cannot be successful themselves, and their coming interferes with the ranching industry.

I closed the season's work and left for home on December 17.



## APPENDIX No. 13.

## ABSTRACT OF THE REPORT OF P. R. A. BELANGER, D.L.S.

## INSPECTION OF CONTRACTS IN NORTHERN ALBERTA.

After organizing at Edmonton the party left on April 8, 1914, for Atikamisis Lake settlement in tp. 8-11-5 where our first work was situated, travelling to Sawridge on the Edmonton, Dunvegan and British Columbia railway and thence by trail to our destination. The subdivision in tps. 80-11-5 and 80-12-5, the survey of the settlement and the running of tie lines to connect Indian reserves Nos. 155-A and 155-B with the 21st base line kept us busy until July 31 so that I was unable to begin inspection work until August 1.

A wagon road from Grouard leads in almost a direct line to Atikamisis Lake. The settlement consists of sixteen lots varying in size from twelve to eighty acres each. Fishing and trapping form the chief industries of the half-breed settlers at this place. The only cultivation of the land consists of a little gardening, with the exception of a small portion near the lake front. The settlement is well timbered. When cleared the land will produce all kinds of cereals and vegetables.

The first inspection work was in contract No. 12 of 1914, about fifteen miles north of Grouard. The trails from Grouard to Atikamisis Lake and from Grouard to Peace River Crossing, both cross this contract. The whole surface is timbered except a small belt of open land near the main trails where there are some good homesteads.

Our next work was in contract No. 6 of 1913, on the south shore of Lesser Slave lake. This contract is crossed by the Edmonton Dunvegan and British Columbia railway. The surface is covered with bush and although the land is suitable for farming purposes it needs considerable clearing. The townships in contract No. 4 of 1913, which was next inspected and which lies on the north side of the lake, are similar to those in contract No. 6. A road, a very rough one, along the north shore of the lake gives access to this district.

Contracts Nos. 8, 10, 11 of 1914, and contract No. 19 of 1913 were next inspected. These contracts all lie west and northwest of Winagami and Round lakes. The soil in this area is good but the land is covered with bush consisting of green and fire-killed spruce and poplar. Trails made by the surveyors run in all directions through the district. Homesteads will likely be taken up there as soon as the Edmonton, Dunvegan and British Columbia railway is in operation to Round lake at which point the road branches, one line going to Peace River Crossing and the other west towards Spirit River and Pouce Coupé settlements.

From Round lake district we returned to Grouard for supplies and then proceeded to contracts Nos. 5, 6 and 7 of 1914, north of Sturgeon lake. The surface in this district is generally rolling and is broken by several deep ravines near Little Smoky river. The land is mostly timbered except for a stretch of *brulé* in township 73 across ranges 22 and 23 where there are some good quarter-sections which do not require much clearing. West of Snipe lake there is a stretch of burnt country where hay grows luxuriantly, affording an ideal grazing district.

Our last work for the season was the inspection of contract No. 15 of 1914 in the vicinity of Wabiskaw lake. To reach this work we returned from Grouard by rail to Edmonton, thence to Athabaska and from there by trail to Wabiskaw lake. The land



6 GEORGE V, A. 1916

in this contract is rolling and is mostly heavily timbered with poplar and scattered spruce, but large areas of good hay land are found in most of the townships. The district is well adapted for mixed farming but the difficulty of access is the great drawback. At present it is reached by a pack-trail from Athabaska, a distance of about 125 miles. It can also be reached by a summer pack-trail from Sawridge and this trail could be converted into a good wagon road with small expense. Such a road would furnish good communication with the railway, promote the fishing industry of the Wabiskaw lakes and attract homesteaders to a fertile area.

Having completed this inspection I closed operations on January 16, 1915, and left for Edmonton.



## APPENDIX No. 14.

## ABSTRACT OF THE REPORT OF G. A. BENNETT, D.L.S.

## STADIA SURVEYS IN WESTERN SASKATCHEWAN.

During most of the season my work consisted of the investigation of water areas in western Saskatchewan. Bodies of water recorded by previous surveys were examined and a stadia survey made of their present boundaries. A careful exploration of the country was also made for lakes not recorded on previous surveys. In the hills, this necessitated the examination of almost every quarter-section.

My first work was in the vicinity of tp. 35-15-3; many alkaline lakes were found in this district. The country is rolling to hilly prairie with patches of willow brush. Almost all the land has been homesteaded and the settlers appear fairly prosperous. Some of the land is too light for grain growing, and so the greater part of the income of the farmers is derived from dairying.

We next made an investigation and the necessary surveys in townships 27 to 30, ranges 24 to 29 inclusive, west of the Third meridian. Also tp. 29-1-4 and tp. 28-3-4 were fully investigated and surveyed.

These townships are composed of rolling to hilly prairie. The land has practically all been taken up, and about twenty-five per cent is under cultivation. The homesteaders are gradually working into mixed farming and now supply the local demand for eggs and dairy products. The hot winds and drought very nearly destroyed the grain crops this year throughout this district.

A number of townships in the vicinity of Tramping lake, were next explored and surveyed. There almost all the marshes, sloughs and lakes, which existed at the time of the original survey, were found to have dried up. White Heron lake in tp. 34-22-3 may be specially mentioned as an example of the changing topography. This lake which covered an area of 820 acres when first surveyed was found to be absolutely dry. The settlers had a fine road graded across the centre of the old lake bed, and homesteaders were applying to be allowed to go upon the dry bottom to try farming it.

A gradual improvement in the crops was noted as we carried our investigation north. Around Tramping lake good yields of wheat and fair crops of oats were harvested.

I closed my stadia surveys on October 15, stored the outfit and accompanied only by my assistant, I proceeded to Alberta to make some small miscellaneous surveys. Our first work of this kind was in a group of ten townships around Sullivan and Dowling lakes, southeast of Stettler.

This district has been homesteaded during the last few years and the settlers are successfully engaged in mixed farming, and already they have fine houses and commodious barns. Vast quantities of hay are cut every year by the homesteaders in the marshes around the numerous lakes and sold to the large ranchers to winter their thousands of cattle for which there is not now sufficient winter pasture. Ducks and geese were noticed in great numbers on the lakes, and prairie-chickens were fairly plentiful.

On November 12, I proceeded to Innisfail to investigate the survey of the 9th correction line across ranges 28 and 29 west of the Fourth meridian. On making a retracement survey I found that errors in the survey of the south side of the correction line had closed the road entirely in some places. The settlers of the vicinity



6 GEORGE V, A. 1916

were most pleased to find that steps were being taken towards opening up this road, which they desire to grade and make their principal road to town. This district has been settled many years and the farmers are now well-to-do.

Retracement surveys were next made in tp. 37-25-4. This township is very hilly and covered in parts with heavy scrub willow, yet it has been homesteaded and the settlers are engaged in dairying.

I then surveyed a small lake in tp. 55-24-4, which had dried up considerably since the previous survey.

The retracement required to correct the records with reference to the position of a witness monument in tp. 42-28-4 completed the surveys for which I had received instructions. I therefore closed operations and reached home on December 3.



## APPENDIX No. 15.

## ABSTRACT OF THE REPORT OF G. H. BLANCHET, D.L.S.

SURVEY OF PARTS OF THE 24TH AND 25TH BASE LINES, WEST OF THE FOURTH MERIDIAN,  
NORTHERN ALBERTA.

On May 1, 1914, I left Athabaska with my party and outfit, loaded on three scows, and proceeded down the river to McMurray, arriving there on the 11th. At this point the horses, which had been sent overland via Lac la Biche, were loaded on the scows. The following day we reached McKay, where we cached supplies to be used on the survey of the 24th base line. We then floated down to Tar river and landed the remainder of the outfit.

A pack-trail was opened up along Tar river to its intersection with the 25th base line (north of township 96) at the westerly side of range 12, which was the starting point of our survey. We reached there on May 18 and the following day after retracing a portion of range 12, the production of the line westerly was begun.

From Athabaska river, which crosses the line in range 10, westerly towards Birch mountains, the country rises steadily, the ascent becoming marked in range 13, at the westerly side of which the summit of the southeasterly spur is reached. The easterly ascent has for the most part escaped fires and is covered with a fairly heavy growth of poplar, spruce and jackpine, and is well drained.

Birch mountains is the name applied to an extensive elevated area occupying most of the country lying between Athabaska and Wabiskaw rivers and having for its approximate south boundary a line joining the mouth of Calumet river and Chipewyan lake. The boundaries of this area are very irregular and its surface varies greatly in roughness and in the direction of its ridges. A marked feature of this area is the accumulation of boulders at the surface, indicating its probable origin as glacial. The rolling nature of its surface gives it in general a fair drainage. In range 14 Joslyn creek is crossed, flowing through a wide deep valley. It emerges from the hills a short distance to the south and flows through an undulating country enriched by the alluvium from the hills, and which in general is fairly well timbered with poplar and small areas of spruce. North of the line along Joslyn creek the country is rough, hilly and for the most part burnt over.

In range 15 the country draining into Namur river is entered, the streams flowing southwestwardly. Namur river crosses the line near the middle of range 16, and is the largest stream in that part of the country. It has its principal source in the lake of the same name which is crossed by the line at the end of the next range. Another fairly large branch of it rises to the northeast near the Athabaska. It continues south and a little westerly to the correction line and then swings in a northeasterly direction to Athabaska river. The country along this river where it runs through the hills has not much agricultural value, but along its lower course there are considerable tracts of good poplar lands. This river with its tributary streams forms the main drainage of the country extending from the 26th base south to the correction line between the 24th and 25th base lines, and from Athabaska river westward to range 19. Namur lake, the southerly end of which is crossed by the base line in the westerly side of range 17, is about seven miles long and from one to two miles wide and is surrounded by high lands. It contains several islands and has a gravel bottom. Fish abound in this lake. There is a possible canoe route from it to the Athabaska.



After leaving Namur lake a well-pronounced divide having a northeasterly and southwesterly course was crossed. This ridge, on which the maximum elevation in this part of the country is reached, forms in general the "height of land," although there are several cases where drainage passes around it. The line descends abruptly in the westerly part of range 18 to Legend lake, so called from the superstitious dread the Indians have of it on account of monsters supposed to inhabit it. This lake is about nine miles long and varies in width from one and a half to three miles, the base line crossing at its southerly end. It forms one of the principal sources of Birch river. Here also fish are abundant, and in the surrounding hills are many moose and caribou.

Westward from Legend lake the line enters a moderately rolling country of fairly high altitude, which is dotted with small lakes draining through small sluggish creeks to the north, and there uniting to form Mikkwa river. From range 20 Mikkwa river occupies a well-defined valley near the 25th correction line, the hills north of it forming the divide between it and Birch river. The base line follows the high land to the south which divides its drainage from that of Liége river. Thus it can be seen that in the neighbourhood of the 25th base line in ranges 18 to 20 five large streams have their sources, namely: Namur, Birch, Mikkwa, Liége and Dunkirk rivers. Birch mountain plateau, except along its borders or large valleys, contains large areas of muskeg, and the soil on the ridges is light and contains many boulders. Little merchantable timber remains.

While extending the line across range 21 a fire got into our cache, destroying most of our supplies and making it necessary to move back about eighty miles to our supply depot at McKay, which we reached on July 13. It was decided to leave the remainder of the 25th base line till after the 24th was completed and then return to it from the west. While at McKay some of the men left, and it was over a month before the party was made up to full strength again.

We travelled from McKay by an old Indian trail, to its intersection with the 24th base (north of township 92) at the east side of range 11, and moved along the line to the end of this range where our work began. Heavy rains during the next few weeks hindered the work considerably. An attempt was made to move a cache up McKay river which crosses the line at the east side of range 12, but it was found too crooked and after the first few miles too much broken by rapids.

McKay river drains the country south of the Namur and north of Thickwood hills, and has a drainage area of roughly sixty miles by thirty. The river enters the Athabaska about eight miles north of the line in range 11. It flows in a deep narrow valley with limestone outcrops in many places. Above these outcrops are extensive beds of tar sands whose richness is shown by tar springs at several points. About eight miles up-stream Dover river comes in from the north. After crossing the line in range 12 McKay river swings westerly to range 16 where it is about eight miles south of the line. Here it forks, the main river turning south while a large branch called Dunkirk river comes in from the northwest. This crosses the line in range 18 and again forks, both branches rising in the Birch hills to the north. The country adjacent to McKay river and its branches, except in their headwaters, is for the most part well timbered with poplar, spruce and jackpine. Small water-powers could be developed easily and cheaply at many points. Much of the country lying between the different branches is of fair agricultural quality.

From range 17 to range 20 the line ran through a very level stretch of country in which the drainage is sluggish and consequently, the country is practically all muskeg extending north to the Birch hills and to the south forming part of the great interior muskeg.

At the westerly side of range 20 the line ascends the southwesterly extension of Birch hills and continues on this elevated area to the meridian. The surface varies from rolling to rough and much of it has been fairly cleanly burnt over, but to the north



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the country is more timbered. Numerous fairly large creeks rise in the hills to the north and flow southwesterly into Wabiskaw river. There as elsewhere, on the Birch hills the surface is thickly strewn with boulders, and the soil is inclined to be light. The principal stream flowing through this portion of the country is that called Liège river which drains the country south of the Mikkwa and west of McKay river.

The Fifth meridian was reached on October 7.

We still had twenty-one miles of the 25th base line to complete so proceeded by way of the Burnt lake trail to its intersection with the Fifth meridian and thence along the meridian trail to the northeast corner of tp. 96-1-5, whence we opened up a trail easterly to near where work had been abandoned. Most of this travel was over bad muskeg and as the horses were loaded heavily and feed poor and scarce, the trip tried them severely, playing out the older and poorer ones completely.

The work of completing the line proceeded rapidly. The country passed through by the line was that adjacent to the divide between Mikkwa and Liège rivers; although of high altitude and rolling, it was principally muskeg in which the feeders of both streams have their rise. This portion of the country at one time supported a heavy growth of timber in places, but this has been almost completely burned off and is replaced by a thick second-growth of spruce and jackpine.

The line was completed to the Fifth meridian on October 29 and on the following day we started for Edmonton, travelling by Wabiskaw river trail to Wabiskaw and thence by the mail route to Sawridge. The contractors of the Edmonton, Dunvegan and British Columbia railway were operating a passenger service to Edmonton and we were able therefore to travel the remainder of the distance by train.

We reached Edmonton on November 21 and the party was disbanded the same day.



## APPENDIX No. 16.

## ABSTRACT OF THE REPORT OF E. P. BOWMAN, D.L.S.

## STADIA SURVEYS IN SASKATCHEWAN.

The work on which I was engaged during the season of 1914 consisted of an investigation of all water areas in certain townships which had been subdivided a number of years ago, and the survey by stadia of all water areas over five acres in extent which appeared to be permanent.

It has been found that in some cases these water areas have changed considerably since the time of the original survey, especially in prairie country, where many of the lakes previously traversed have either dried up entirely or dry up during the summer, thus rendering new areas suitable for agricultural purposes. In bush country, however, the reverse is often found to be the case, new lakes, missed in the original survey, being found. These cause complaints from the settlers, when they find that parts of their homesteads are useless for farming because of previously unsurveyed bodies of water.

In addition to the investigation of water areas, considerable retracement work was done, monuments being erected at section and quarter-section corners where bodies of water, which prevented the erection of monuments at the time of the original survey, have dried up.

My first work was to complete the investigation of water areas in townships 37 to 40, inclusive, ranges 14 to 17, inclusive, west of the Third meridian. I also included tp. 40-18-3 in my work in this district.

The general nature of this block of townships is fairly uniform with the exception of tps. 39 and 40-14-3, and the north part of tp. 40-15-3, which are mostly bush country and have some deep permanent bodies of water. Throughout the greater part of the district the lakes seem to be gradually drying up, although there are a few exceptions. Most of them are quite shallow, containing chiefly alkaline water, some with very soft, and others with fairly solid beds. Nearly all small marshes shown formerly on the township plans at section and quarter-section corners had dried up, allowing the erection of monuments. The surface varies from undulating to rolling and occasionally hilly prairie. Practically all available good land has been taken up. In some townships lands are nearly all patented, while in other townships they are in the earlier stages of homesteading. Settlement is well advanced in some parts and in other parts very little settlement has taken place. Patented lands do not always indicate well settled country, as these lands are often held by the railway companies or by private individuals, who have secured their patents and left their lands, and thus quite frequently a district in which homestead duties are being carried on presents a better settled appearance than those where lands are all patented. Grain growing is the main industry pursued by the farmers and gives good success, although mixed farming is followed in parts more remote from the railways and where hilly or stony land is found. The latter method seems to be gaining in favour among the settlers. Graded roads are being constructed in most of the townships along the road allowances, and where these are not built good trails are generally found. Water is obtained by digging or drilling to a depth of from fifty to one hundred and twenty-five feet. Fuel is obtained by teaming from the forest reserve in tp. 40-14-3, although coal is used by some. The Battleford-Biggar branch of the Grand Trunk Pacific railway has been a great help in the development of this district.



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In addition to the investigation and traverses of lakes in this block of townships, seventy-three section and quarter-section corners were established, necessitating the retracement of about eighty-six miles of section lines.

Crops in this district were rather light in some parts, due to dry weather in the early part of the summer.

The work in this district was completed on September 8. I then moved north to investigate townships 52 in ranges 22, 23 and 24. During this move, we passed through the Cutknife district, where the crops were exceptionally good, not having had as much dry weather as other districts farther south where crops were very poor. We also passed through Paynton, crossing the ferry on Saskatchewan river north of Paynton, and continued north till we reached the old Fort Pitt-Battleford trail, which we followed northwesterly to tp. 52-24-3. Considerable very sandy land lies along this old trail, soft drifting sands occurring in many places, thus making transportation of heavy loads very difficult. Very little settlement was found along this part of the trail, the soil probably being too light for farming.

Work was begun in these townships on September 15. They are mostly well settled, most of the settlers being engaged in mixed farming and stock raising, for which the townships are well suited.

I closed operations on October 15 and returned to Battleford on the 16th.

In connection with the condition of water areas this year, the early part of the season was dry and hot, and the water was said to be lower in the prairie district than it usually is. In the country north of Saskatchewan river, particularly the last two townships surveyed, the water was higher than usual, due to heavy rains in August and September. Many of the hay sloughs cut for hay during the summer had a few inches of water in them at time of survey. Englishman river was also said to be much higher than it had been earlier in the season.

In the last three townships surveyed, six section and quarter-section corners were established and six miles of section line were retraced.

The absence of railways in the proximity of these townships is rather a drawback, but the construction of the Edam branch of the Canadian Northern railway through to Turtleford, to which place trains now run, improves conditions.

On our return to Battleford we travelled by way of the old Fort Pitt-Battleford trail, although the road allowances have to be followed the greater part of the way. Very fine farming country lies along the line of the Canadian Northern railway at Edam and other points along the line to Battleford.



## APPENDIX No. 17.

## ABSTRACT OF THE REPORT OF W. J. BOULTON, D.L.S.

## STADIA SURVEYS IN SOUTHERN ALBERTA.

The work on which I was engaged during the past season consisted of the survey of lakes in southern Alberta, my first work being the survey of a lake which crosses the base line between tps. 8 and 9-18-4. This lake is evidently much larger in area than when originally surveyed, due to the fact that it is being used as a reservoir by the Irrigation department of the Canadian Pacific Railway company. The fluctuation in depth is very moderate, and does not materially affect the area of the lake surface. The water is clear and drinkable, but is cumbered with weeds near the shore. The confines of the lake are hills, ranging in height from seventy-five to one hundred and twenty-five feet, the crest averaging a distance of two hundred feet from the water-line.

I then surveyed the portion of a lake lying in township 8, range 18, and those parts of Reservoir, and Chin Coulee lakes in township 9. The area extending for two or three miles on either side of Chin coulée is not settled upon.

On June 29 I moved to range 15, and proceeded with the investigation of townships 9 and 10, which I found to be fairly well settled. An artesian well was found on section 9, in township 10. Townships 7 and 8 are sparsely settled and are chiefly used for sheep grazing.

On July 4, I moved into range 16, and commenced operations in township 7. A large lake extends from section 26 in range 16 to section 36 in range 17. This lake is now an abandoned irrigation reservoir, the course of the water having been diverted in another direction. The lake at present has no inlet or outlet, but is fed to a certain extent by springs. The water is gradually receding, but the rate of recession is so small that the lake may be considered as permanent in character. The shore-line is quite definite and stony, and the immediate confines quite steep.

This lake, as is the case of the other lakes in Chin coulée, provides a means for the farmers in the district to water their stock, and in fact, renders it possible for them to engage in the stock-raising industry.

There is no doubt that the district to the east, up the coulée, in township 7, range 15, could be rendered useful for stock raising by raising the elevation of the lake just mentioned, about six feet, and constructing a small ditch between that lake and the low-lying land immediately to the east. This would create another large lake in the coulée, and enable the few farmers, already in the district, to have a much shorter water haul, and would ultimately induce others to come into the district and raise stock.

I next investigated tps. 7, 8 and 9-17-4 and tps. 8 and 9-16-4. I first finished the survey of the lake which I had started, while investigating tp. 8-18-4, and which I found to extend into range 17, running southeasterly from section 19 to section 2, thence into section 35, tp. 7-17-4. At the eastern end of this lake is found the immediate source of water supply in the form of an irrigation canal conveying the water from St. Mary's river. These townships are fairly well settled, and a goodly portion is under cultivation.

On July 28, I proceeded to township 9, range 19, from which I thoroughly investigated townships 8 and 9 and parts of townships 7 and 10.





Photo by F. V. SEIBERT, D.L.S.

#### SHOOTING GRAND RAPIDS—ATHABASKA RIVER.

After unloading at the head of Grand Island, the scow is taken back to the right-hand channel, and run through to the eddy below the foot of the island. At low water this is a very difficult undertaking for the channel is, in many places, just wide enough for a scow to pass, and the current is so swift that it leaves a very small margin of control of the scow by the crew. Only a few of the best river men will undertake this, and then only with the very best crew.



Photo by F. V. SEIBERT, D.L.S.

#### STUCK ON A ROCK IN GRAND RAPIDS—ATHABASKA RIVER.

At low water, this rock is in the middle of the channel and impossible to avoid. Fortunately it is round and smooth and seldom does damage to the scow. Sometimes the scow slips over without stopping, but when it stops, it must be kept heading down stream. In the view, a pole against the port bow keeps it from swinging. Should the scow swing, the chance of saving it from being broken to pieces is small.







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In township 9 I found the areas of four lakes to be considerably augmented, as they are being used as irrigation reservoirs. Generally speaking, these lakes are very shallow, with a more or less indefinite shore-line, and are much overgrown with weeds. The areas are subject to slight variations, depending entirely upon the amount of water used or wasted in irrigating the district.

The southerly part of township 9 and the northerly part of township 8, have been thoroughly irrigated, and some excellent crops of alfalfa, clover and potatoes were grown during the season. Excellent grazing is found in these townships, and many farmers, engaged in mixed farming, are making substantial profits.

On August 19, having ascertained that Belly river was normal, I decided to prosecute my investigations in the townships traversed by this stream. Consequently I moved north and commenced operations in sec. 36, tp. 10-19-4 and gradually worked east across tp. 10-18-4 and tp. 10-17-4, thence north through tps. 10, 11 and 12-16-4, finishing up on the E. By, sec. 13, tp. 11-16-4, which was the easterly limit of my district. About the time I completed this work, the district was visited by an extremely heavy and wet snowstorm, which continued intermittently for about ten days. In the meantime, I moved through almost impassable roads to tp. 10-19-4 and succeeded in completing the survey of Belly river in this township and in township 11, range 18, on October 14.

The course of Belly river is very winding and many nice flats are available on the convex sides of the bends, while the concave sides are generally cut banks about seventy-five feet high.

The river is not so wide as it was at the time of the original survey, due no doubt to the immense amount of water now being diverted through irrigation canals leading from St. Mary's river. Consequently there is considerable forest growth to be found on what were once termed "sand-bars."

The maximum flow usually occurs in June or July, and the minimum in January or February, the difference in the height of the water, being ordinarily, about five or six feet.

There is plenty of good household coal to be found along the valley of Belly river, the seams being plainly evident in the cut banks. They vary from two to five feet in width.

Work on Belly river was impeded at times by the presence of rattlesnakes. Fortunately none of the party were bitten, although we managed to kill twenty-five of the reptiles.

On October 14, I moved to Coaldale, a small town on the Crowsnest branch of the Canadian Pacific railway, and intended to complete the investigations which I had begun in tps. 8 and 9-20-4, and tp. 7-19-4, but the country, especially in the central part of tp. 9-20-4, was completely inundated by the over-supply of irrigation water, which seems to be very poorly controlled.

Some parts of the townships in the district showed signs of there having been lakes at one time, but it is so long since, that the vegetation in these low-lying parts is on a par with that of the surrounding country.

The district is, generally speaking, more or less settled upon, and considerable land has been broken and once cultivated, but during the past few years, the precipitation has been so slight that much of the land is being allowed to return to its original prairie state, and many places are being abandoned.

Scarcity of water seems to be the chief drawback to this district. When properly irrigated, however, the soil, which is generally of a light sandy nature appears to be very productive. The Irrigation department of the Canadian Pacific Railway company had, during this season, four parties of engineers making preliminary investigations in this district, with a view to ultimately constructing irrigation canals and dependent laterals. In the event of this work being done, this district will prove to be one of the most productive in the province of Alberta.



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The trails, throughout the entire district are first-class and are, in general, confined to the regular road allowances.

Shipping facilities are of the best as the Crowsnest branch of the Canadian Pacific railway passes east and west through the centre of the district, and along it there are elevators erected every six or seven miles. Another branch of this railway, which will be known as the Lethbridge-Weyburn line and which follows approximately the 2nd correction line, is being constructed through the district.

The whole district seems to be underlaid with coal, and it is being mined extensively in the vicinities of Lethbridge and Taber.

Many ducks and geese were seen around the lakes in Chin coulee, especially those in tp. 9-10-4 which are veritable duck ponds. Many antelope were also seen along Belly river.

In eleven of the townships, which I investigated, I found no water areas at all.

I closed operations and paid off my party on October 17.



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## APPENDIX No. 18.

## ABSTRACT OF THE REPORT OF L. BRENOT, D.L.S.

## SUBDIVISION IN PEACE RIVER DISTRICT.

My survey work during the summers of 1913 and 1914 and the intervening winter consisted chiefly of the subdivision of lands suitable for settlement along the Peace river valley between Fort St. John and Hudson Hope.

Most of the fertile land in this district lies on the north side of Peace river, the land south of the river having been so often overrun by fire that it is almost sterile. The areas surveyed on the north side of the river are easy of access, and consist mostly of flats and bench land in the river valley. The notable exceptions are a plateau north of Fort St. John and an area in tps. 83 and 84-20-5 known locally as "Jim Rose prairie." The bench land and flats are backed by hills from 700 to 1,100 feet high, and the steep slopes of the hills are covered with luxuriant grass which appears early in spring, before the snow has disappeared from the valleys. These grassy slopes will furnish admirable ranches for stock from the farms situated on the benches and flats.

The good land in the flats is covered with small poplar which will have to be cleared and this may prevent the early settlement of the district. Settlers are located on Halfway flats in tp. 83-22-6, on Cache creek flats in tp. 84-21-6 and on South Pine flats in tp. 83-18-6. We subdivided the land at all of these points. South Pine flats, though not of great extent, encroach on four townships, and over eighty miles of outline had to be run before making the subdivision.

While in that vicinity we ran the boundaries of timber berth No. 2052, in townships 80 and 81 ranges 15 and 16. This work carried us late into the fall, and as the ice was commencing to run in the river, we abandoned subdivision work in that vicinity and left for Hudson Hope.

As soon as the river had frozen over I subdivided part of tp. 82-25-6. I then cut a trail to Moberley lake district and performed the subdivision necessary in tps. 79 and 80-24-6; the trail cutting was rendered very difficult by the dense undergrowth.

Having finished this work, I returned to Hudson Hope and resurveyed the Hudson's Bay company's reserve there. I then divided the party, sending four men and one assistant to level the west boundary of Peace River block between the 21st and 22nd base lines, and with the remainder of the party I proceeded to survey a number of township outlines and subdivide the land suitable for settlement in tp. 82-24-6.

When the levelling and subdivision were completed we built a raft and floated the outfit down Peace river to Fort St. John. While on the raft I took soundings of the river and found the average depth in mid-channel to be about ten feet, though in places it was only five feet. The current runs from three to five miles per hour and the width of the river ranges from twenty chains to one mile.

At Fort St. John we surveyed two Hudson's Bay company's reserve lots, and finished the subdivision of South Pine flats. I closed operations on September 26, and left for Edmonton, where I arrived on October 10.



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The climate of the Peace river district is similar to that of eastern Canada and is free from extremes. The summers are moderately hot and the rainfall is adequate. Summer frosts were of somewhat frequent occurrence during our survey, but were not severe enough to do much damage. During a cold snap in the last two weeks of January, 1914, the thermometer registered  $-54^{\circ}$  F., but after the Chinook winds began about the middle of February the temperature was rarely many degrees below freezing point.

The snowfall is not very heavy. Trails connect the various settlements, though the fording of rivers whose beds are composed of shifting sands, renders travel in summer dangerous. The ice on Peace river, which is safe from the middle of January to the middle of March, furnishes a good road for winter travel.

Post-offices are established at Fort St. John and Hudson Hope, mail being taken overland from Lake Saskatoon once a month. The service is rather uncertain, as it depends largely on the condition of the various rivers crossing the trail. The Edmonton, Dunvegan and British Columbia railway when built will greatly assist in the development of this district.



## APPENDIX No. 19.

## ABSTRACT OF THE REPORT OF M. P. BRIDGLAND, D.L.S.

## TOPOGRAPHICAL AND TRIANGULATION SURVEYS IN SOUTHWESTERN ALBERTA.

My work during the season of 1914 consisted of a topographical survey of the southern part of the Crowsnest Forest reserve, and a retracement of the triangulation of the Rocky and Selkirk mountains from Calgary to within a short distance of Golden.

In order to complete these two surveys in one season it was considered advisable to start work on the latter as early as possible. Accordingly on May 12, I engaged one man and commenced this survey which was continued until May 26. During this period signals were erected at stations I to VIII inclusive, and angles read at stations I to VI inclusive. An azimuth observation was taken at station III.

As further work was then impossible, owing to the amount of snow still remaining on the higher peaks of the mountains, I returned to Calgary, engaged more men, and on May 27 proceeded to Lundbreck where the camp equipage and supplies had previously been shipped. From there we proceeded to our first camp in tp. 6-3-5 from where the survey of the Crowsnest Forest reserve was carried on until July 6.

Two extra men were then engaged, and the party was divided. My assistant with three men moved south to Beaver Mines and continued the survey of the reserve, while I with four men left for Morley on the main line of the Canadian Pacific railway, to continue the triangulation survey.

This was completed on August 31. During the intervening period thirteen stations VII to XVIII inclusive, and station "C," Beaverfoot range, were occupied, nine of which were over 9,500 feet above sea-level. Angles were read at all these stations and azimuth observations taken at Beaupre hill and Mt. King. A third azimuth observation was taken in the Bow valley near Storm mountain. All stations not previously marked were marked permanently.

On September 1, my horses and outfit were shipped by train from Field, B.C., to Hillcrest, Alberta. From there we moved south, and on September 7 joined the other party on the headwaters of Yarrow creek in tp. 3-1-5. The remainder of the season was spent by the combined parties in completing the survey of the Crowsnest Forest reserve.

The last main camp was near Waterton lakes, and supplies were brought out from Pincher Creek. At this point a very heavy snowstorm began on October 2 and lasted several days, rendering further work impossible. The party returned via Pincher Creek, reaching Calgary on October 8.

The southern part of the Crowsnest Forest reserve is about seven hundred square miles in area, and comprises the eastern slope of that part of the Rocky mountains lying between the Crowsnest branch of the Canadian Pacific railway and the international boundary. The summit of the Rocky mountains, the western boundary of the reserve, crosses the international boundary in range 1, west of the Fifth meridian, and extends in a northwesterly direction to tp. 7-6-5. The eastern boundary, which is laid out on section lines of the Dominion Lands system, and is approximately parallel to the summit, lies about fifteen miles farther east. To the north in townships 5, 6 and 7, the peaks along the summit are from 8,000 to 9,000 feet high, while east of this the hills are low and rolling, only a few of the higher points rising above timber-line. Still farther east, beyond the reserve, the hills drop off gradually toward the prairie. Farther south, in townships 1, 2, 3 and 4, the main range loses its distinctive characteristics. It



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becomes much more broken and several good passes exist, of which the Akamina pass in tp. 1-1-5, is worthy of note, being crossed by a good wagon road. The country to the east becomes much more rugged and broken, peaks from 7,500 to 8,500 feet in height extending to the easterly limit of the reserve, where the change from mountains to very low foot-hills or rolling prairie is very abrupt.

As in the previous season, no organized system of triangulation was carried out, but angles were read to connect different stations as well as possible. Stations adjacent to the railway were located by the traverse made in 1913, and these in conjunction with the Dominion Lands system posts were used to locate the stations in townships 5, 6 and 7. Farther south, a closed triangulation, made in 1912 by the Geological Survey of Canada and based on the international boundary surveys, was used as a control, though several ties were made to the Dominion Lands system. Elevations were carried from stations south of the railway, altitudes of which had been determined by the traverse of the Crowsnest branch of the Canadian Pacific railway during the previous season.

The season of 1914 was not very favourable for photographic surveys. The time spent in the field from the date of commencing until the closing of actual work was one hundred and twenty-five days. During this period forty-six days were totally lost owing to bad weather, and many other days were partially lost. In September, when trying to complete the work, while only thirteen days were entirely lost, there were but nine fine days during the entire month. Much difficulty was caused throughout the whole season by high winds, which made it almost impossible to keep the camera steady or to read satisfactory angles with the transit. During the season one hundred triangulation stations, exclusive of section corners or secondary camera stations, were occupied, and sixty-three dozen plates were exposed.

Nearly all of the country is easily accessible. Wagon roads lead along the eastern escarpment, and in some places run well into the reserve. Good pack-trails with easy grades, and free from swamps or muskegs, are found in all the main valleys. Pasture for horses is very plentiful along the eastern slopes, and occasional meadows are found farther in toward the mountains. Flowers and vetches were not seen in nearly as great variety or abundance as in the previous season, while north of the railway, wild black currants were the only edible berries found in any quantity.

The western part of the reserve is heavily forested right up to the escarpment of the main range, and in the southern part where the country is more broken nearly all the main valleys are well timbered. Although the slopes adjacent to the railway have been burned, the greater part has not been touched by fire and contains much excellent spruce, with some fir. Jackpine up to one foot in diameter is found in places. In the eastern part the slopes and valleys are more open with much small poplar and willow, and scattered clumps of fir and jackpine.

Large deposits of coal occur in townships 5, 6 and 7, and mines have been started in several places, but only those near the railway are being worked at the present time. Oil wells have been drilled in three places, but no oil has been found and the wells are now abandoned. Farther south in tp. 1-30-4, there is another well which was started some years ago and abandoned. It is now being worked under new management, and at a depth of 970 feet is yielding fifteen to eighteen barrels of crude oil per day. It is intended to drill deeper as soon as the winter is over.

Fish and game are said to be very plentiful. Fish, however, did not seem nearly so numerous as in that part of the reserve north of the railway, although the Waterton lakes district is considered a good fishing place, and is a popular summer resort. There are some bears, and deer and goats were occasionally seen. On Sheep mountain, near Waterton lake, several mountain sheep were seen and the whole mountain was covered with fresh tracks. Prairie-chickens were common in the open hills near the prairie, but game birds of other varieties did not seem numerous.



## APPENDIX No. 20.

## ABSTRACT OF THE REPORT OF J. A. CALDER, D.L.S.

## SURVEYS IN THE RAILWAY BELT OF BRITISH COLUMBIA.

My survey work of the past season was begun on April 17 in tp. 17-25-6 where we did some retracement work and traversed the left bank of Thompson river through sections 3 and 4. This traverse was necessary on account of a huge earth slide which took place on the opposite side of the river several years ago, changing its channel a quarter of a mile in one place. It is usually considered unsafe to irrigate elevated benches along Thompson river in this part of the dry belt, for should there be a substratum of clay, with a decided slope towards the middle of the valley, the seepage may give the normally rigid clay a greasy quality and thus cause the overlying mass of earth to slide.

Sections 1 and 2 of this township fall upon the side of a high rocky mountain between Thompson and Nicola rivers, near their junction, and with the exception of some fair grazing on the lower slopes these sections are of little value.

The climate and soil around Spence's Bridge are very well suited for almost all kinds of fruit and vegetables. Sheep raising has been attempted in a small way and with fair success.

On April 30, I moved by wagon to Twaal creek, about five miles north of Spence's Bridge, and began subdividing in tp. 17-25-6. These surveys were continued into tp. 18-25-6, to include all the suitable land. The boundaries of Cook's Ferry Indian reserve No. 6 were retraced, and the monuments at the corners restored. This reserve extends along Twaal creek for about seven miles, and includes practically all the best agricultural land in the bottom of the valley. The elevation increases rapidly towards the source of the creek, with a consequent increased danger from summer frosts. A good pack-trail follows along Twaal creek with branches leading into Venables and Upper Hat creek valleys. The latter trail does not appear to be very much used, for it has become obstructed by windfall in many places.

I connected my surveys in Twaal valley with the earlier surveys in Venables valley, tp. 18-25-6, and retraced a number of old provincial lots there.

The chief industry in Venables valley is stock raising, for which it is well adapted. There are good hay lands in the valley affording winter feed, while the range land towards Twaal creek is utilized during the grazing seasons.

Upon the completion of the surveys in this vicinity, I left on July 6 for Botanie lake, in tp. 16-26-6, where I was instructed to survey such grazing lands as I deemed to be of value. Lytton Indian reserves Nos. 1 and 15, include much of the best grazing and agricultural lands around the headwaters of Botanie and Skoonka creeks. These creeks are separated by a low divide about half a mile north of Botanie lake.

Subdivision was carried into tp. 17-27-6, in order to include some good range land in sections 12, 13 and 24, and connect with earlier surveys on Luluwysin creek. Some bench land at the forks of Luluwysin creek, tp. 17-27-6, was also surveyed. This is excellent agricultural land, but as is usual with small streams in the dry belt, all the available water in the creek is already recorded. This is a condition general to the dry belt and the remedy, equally general, is in this instance furnished by Pasulko lake at the head of the south branch of the creek, which forms a splendid reservoir for storing the copious freshet waters of the early spring.



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Botanie lake, a little more than a quarter of a mile long, is well stocked with trout, and is a favourite camping place during the summer for people desirous of escaping the heat of Lytton. While we were there a survey was being made for the purpose of increasing the storage capacity of the lake for irrigation. A portion of Skoonka creek is now diverted by a ditch into Botanie lake.

From Lytton, a good wagon road has been graded to within four miles of Botanie lake, and is passable by wagons to the south end of Pasulko lake, but it is soft in places during spring. Good trails radiate from this road towards Fraser river, Upper Hat creek and Spence's bridge.

On August 31 I left Botanie lake to establish the boundaries of the Nicola Forest reserve from Pimainus creek northerly through townships 17 and 18, range 24. I also completed the retracement of Cook's Ferry Indian reserve No. 9. Most of the sections surveyed in these townships are hilly and only suitable for ranching. There is a strip of fair bench land, between the forest and Indian reserves, south of Inkikuh creek which, although stony in places, should prove valuable if irrigated. Pukaist creek flows through a narrow ravine in sections 9, 15 and 16 in township 18, but farther up there are good benches and meadow land, some under cultivation, the principal crop being hay. An excellent wagon road, from Ashcroft to Highland valley, passes through the northeasterly corner of tp. 18-24-6. A branch of this road leads to Spatsum, but it is ungraded and very rough and steep. A good pack-trail from Toketic follows Pukaist creek. I moved my outfit over this trail to the wagon road.

On October 1, I moved to Barnes lake where six miles of the boundary of Nicola Forest reserve were run, a portion of Oregon Jack Creek Indian reserve No. 6 retraced and some subdivision made in townships 19 and 20, range 24. Only the imperative work was done in these townships, as I was anxious to finish as many as possible of urgent surveys before closing down for the season.

On October 13 I took train at Ashcroft for Savona, where we crossed Kamloops lake, to the mouth of Copper creek, in a gasoline launch. From there we travelled by wagons to our next camp on Frog creek in tp. 22-20-6. A graded wagon road has recently been built along Copper creek from its mouth to near the south end of Red lake. A continuation of this road goes to the settlements on Criss creek, but it is very rough, being graded only where essential to make it passable for wagons.

The portions of townships 22 and 23, ranges 20 and 21, outside the Tranquille Forest reserve, along Frog creek, were subdivided for settlement. This country is elevated, rolling and well wooded with fir and jackpine. There is some good bottom land near Frog creek, and patches of hay meadow are scattered through the lands surveyed. The elevation is too high for most crops but hay. Deer, grouse and rabbits abound.

Upon the completion of these surveys I returned to Savona on October 29 and discharged the party. Taking my assistant, I then proceeded to Gladwin, in order to make a small correction survey. This was completed on November 4.

The season was quite favourable for the work. The months of July and August were very dry, and the smoke from many forest fires at times proved embarrassing.



## APPENDIX No. 21.

## ABSTRACT OF THE REPORT OF W. CHRISTIE, D.L.S.

## SUBDIVISION SURVEYS NORTH OF ATHABASKA.

On May 21, 1914, I left Athabaska with my party and proceeded by boat up Athabaska river to Bald hill in tp. 69-23-4. From there we had to cut a trail northerly to our work around Calling lake.

Another route to reach this district from Athabaska is by the Peace River Crossing road as far as tp. 71-24-4 and thence easterly along the trail from the "Fish Camp" on Athabaska river to Calling lake. A third route follows a trail down the Athabaska to the mouth of Calling river in tp. 70-19-4, thence up the river to Calling lake. The trails on all these routes are almost impassable for wagons, but this season a settler in tp. 70-22-4 cut out the pack-trail which I had made from Bald hill into a wagon trail. The trail from the mouth of Calling river to Calling lake is passable for wagons with light roads during a dry season.

Calling lake, which is situated in townships 71 and 72, ranges 21 and 22, is about ten miles long and six miles wide. It has a stony and gravelly beach except at the southeast end where the shore is sandy. It abounds with whitefish, the catching and marketing of which forms one of the principal industries of this district. Calling river, which is the outlet of the lake, is about fifty feet wide, from three to seven feet deep and flows with a very rapid current. From tp. 71-20-4 to its mouth it is a succession of rapids. Water-power could easily be developed as the valley is narrow and from one to two hundred feet deep throughout most of its course.

South of Calling lake the country is rolling and heavily timbered with poplar, birch and spruce. The spruce is fairly large but very scattered and therefore not of commercial value.

In some areas which have been overrun by fire, and where the timber has been burned off, luxuriant grasses grow, but hay is not abundant except along the creeks flowing into the lake in tp. 72-21-4. Clay ridges with intervening muskegs are frequent, and the land when cleared would no doubt produce good crops of cereals and vegetables.

A small half-breed settlement is located on the northeast shore of the lake. These settlers have some cattle and horses and cultivate a small amount of land.

The muskegs in this district could be easily drained as they are shallow and approach very close to the valley of Calling river, and to a number of creeks.

Petroleum claims have been staked out along Calling river, but no development work has been done. The clay along the banks presents a dark oily appearance.

Game, both large and small, appears to be plentiful in the district. Moose, deer, bears, rabbits, ducks, prairie-chickens, partridges and fur-bearing animals such as foxes, coyotes, muskrats, mink and ermine were seen. Fox farms have been started along the Athabaska and the industry appears to be proving a success.

I closed operations on October 31, and returned to Edmonton.



## APPENDIX No. 22.

## ABSTRACT OF THE REPORT OF G. W. COLTHAM, D.L.S.

## STADIA SURVEYS IN ALBERTA.

The season's work which consisted of the investigation and stadia survey of water areas was commenced on June 15, 1914, and lasted to the middle of October. During the summer, surveys were completed in twenty-seven townships, comprising generally the area from range 9 to range 14 and from township 43 to township 47, west of the Fourth meridian.

The northern part of this area is nearly all occupied by settlers, but only a small part is under cultivation, as owing to the hilly nature of the country ranching appears to be more profitable than farming. Camp lake in tp. 48-11-4 is the only fresh-water lake in the vicinity, and is partly supplied by surrounding springs. Loranger lake, only a few chains farther north, is of an entirely different character; it contains alkaline water and is of a much greater depth.

The land in the central portion, though rolling, is not unsuitable for cultivation, and produces good crops of wheat, barley and oats. However, this part is only recently homesteaded, and the area under cultivation is small.

Towards the west and south the area under cultivation is larger than to the east, and the yield of wheat in some cases was forty bushels per acre. The soil is a clay and sandy loam.

Many coulees run through the eastern part and only the land in the valleys is suitable for grain. The higher portions afford good pasture for cattle and horses.

Throughout the whole area investigated wood is scarce, and is usually only obtainable around the shores of the lakes. The largest timber seen was some poplar about twelve inches in diameter around the shores of lakes in tp. 43-11-4. Soft coal is used for fuel by the farmers. Indications of coal appear throughout the district, but no deposits of commercial value have been discovered.

Very little surface rock is to be found; some loose stone and thin deposits of shaly rock are found in the northern part.

Nearly all the lakes contain alkaline water; they are shallow and seem to maintain a fairly uniform level. A few lakes in the central part have dried up considerably during the last few years.

Small game, such as rabbits, ducks, partridges and muskrats are plentiful, and at one place a dam was built across Battle river by beavers, though none were seen.

The weather during the summer was fine, and the rainfall sufficient for the maturing of crops. No damage was done by summer frosts this season, though the district is subject to them.

Battle river, which flows through the southwest corner of this area, is approximately two chains wide with a current of about two miles per hour. No rapids or falls were seen from which power could be developed. The banks, chiefly clay with sand and gravel in places, rise abruptly to a height of ten or fifteen feet. The river valley, which is very fertile, is quite level and varies from twenty chains to nearly a mile in width. In places it is covered with a thick growth of small poplar.



## APPENDIX No. 23.

## ABSTRACT OF THE REPORT OF J. M. COTE, D.L.S.

## RESURVEYS IN CENTRAL SASKATCHEWAN AND ALBERTA.

We began the season's surveys about May 20, by investigating some river lot monuments along South Saskatchewan river in tp. 20-1-4 and tp. 20-2-4. These townships are fairly well settled, and farmers seem to be doing rather well.

We then left for townships 22, ranges 10 and 12 and townships 21, ranges 11 and 12 which I was instructed to resurvey. For the greater part of the way I followed the trail along the Swift Current-Bassano branch of the Canadian Pacific railway, then under construction. Red Deer river cuts all four of these townships.

The north side of the river is well settled, but unfortunately crops have not been good for the last few years, due to the light precipitation. With the exception of a few springs in Berry creek valley, in tp. 22-12-4, water is very scarce, most of the settlers having to haul it from the river. The water in the Government-drilled well, at the northeast corner of tp. 21-11-4 is alkaline. The worst part of Dead Lodge canyon, in the valley of Red Deer river, lies in the latter township. In this canyon valuable fossils are found, and from a geological standpoint this region is very interesting. Indications of oil have been found.

Upon completion of the resurvey of these four townships, I proceeded on June 26 to Pakowki lake in townships 4 and 5, ranges 7 and 8. The road allowances which I followed run through a thinly-settled country, and the crop prospects in this region were poor.

Owing to continued droughts extending over the last three years, Pakowki lake was this year free from water. As the lake has a large watershed, and no outlet, it will no doubt, refill at the first wet season. The subdivision which I was instructed to do, was therefore produced as far as the well-defined shore line.

A number of settlers have taken up homesteads in the vicinity of the lake. The general lightness of the soil together with the dry climate, and the conditions above described generally prevailing in this district, would seem to indicate that in order to make a success of agriculture, dry farming operations solely should be practised. This district, however, is better adapted for ranching purposes, though the water is more or less alkaline.

After completing these surveys I proceeded to Cygnet lake, near Red Deer, which, according to reports, had been drained by the Alberta Central Railway company. Upon investigation, however, I found that the railroad grading was completed across the lake and that drainage operations had been abandoned. We, therefore, traversed the lake and produced certain subdivision lines.

Excepting those parts cleared by farmers, this well-settled, rolling country is covered with poplar, some of which measure ten inches in diameter. There is ample precipitation and crops are usually good.

On July 25, I started for tp. 54-19-4 which we resurveyed. The western part of the township is rolling and covered with poplar up to fifteen inches in diameter; a few scattered spruce were also seen. The eastern part is more open and well settled. The soil generally is clay loam and crops are good. There are four lakes and many sloughs in the township, and water is fresh and plentiful.



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This work was completed on September 5, when we moved to townships 51, ranges 23 and 24, west of the Third meridian, which we partly resurveyed. The only road available is the one along the main line of the Canadian Northern railway, and as the first part of the month was very wet, the roads were heavy and progress was slow.

Saskatchewan river crosses these two townships, which are covered with patches of willow scrub and poplar, some of the latter measuring twelve inches. The land is rolling, with the exception of that part of township 51, range 24, which lies south of the Saskatchewan, and those lands held by railway or land companies, these townships are well settled and generally the crops are good. Ranching has been carried on very successfully for a number of years. Good hay can be procured around the numerous lakes and sloughs, but with the exception of that in the river, all the water to be found is hard and more or less alkaline. In this region game of various kinds is quite abundant, consisting of moose, deer and a great number of wild geese, ducks, prairie-chickens, partridges, rabbits, etc.

The resurvey of tp. 51-24-3 and the south third of tp. 51-23-3 was made, but a deep fall of snow prevented the completion of the resurvey of the latter township, as the monuments which hitherto had been hard to recognize could not then be found.

I stored my outfit, discharged my men, and left for Ottawa on November 19.



## APPENDIX No. 24.

## ABSTRACT OF THE REPORT OF G. C. COWPER, D.L.S.

## STADIA SURVEYS IN SOUTHERN SASKATCHEWAN.

The survey work on which I was engaged during the past season consisted of stadia traverses of permanent lakes over five acres in area, and of rivers over one chain in width, the investigation of sloughs and dried-up lakes and the extension of the subdivision lines over the dried-up area.

On June 4, I began the season's work on a block of thirty townships north of Maple creek.

On account of the light snowfall last winter, and the abnormal drought in the spring and early summer, I found all the lakes in this district to be dry. Some of these lakes in ordinary years are said to have from three to five feet of water, while others dry up practically every year. A number of these lake beds are now producing hay, while others are composed of soft, wet alkaline mud which does not produce vegetation and which very seldom becomes dry. The lake beds which appeared to be dry only on account of the abnormal season, and which were of no value for agricultural purposes, I traversed, while those which were producing vegetation were not traversed.

The principal lake in this block is Bitter lake in township 13, range 28, and townships 13 and 14, range 29. This lake is about twelve miles long, and varies in width from one mile to a couple of chains at the narrows in section 29, range 28. There is a bridge across the narrows, and this saves the settlers to the north a long haul around the lake to get to the railway. Bitter lake was practically dry at the time of my survey, but its bed consists of soft, wet alkaline mud which never becomes hard.

Many Island lake in townships 13 and 14, range 1, was, at the time of the original survey, a large body of water about seven miles long and six miles wide. This lake has been drying up for a number of years and all that now remains is four small sloughs, and even these sloughs were dry this year. These sloughs have a sandy bottom with the shore line poorly defined, but they will likely fill up again. The remainder of the old bed is mostly gently rolling prairie, covered with a good growth of grass.

This block of townships is mostly rolling prairie, ranging from almost hilly in some townships to gently rolling in others. The soil is mostly a sandy loam with clay subsoil, and is well suited for the growing of grain and vegetables. Good water is obtained at a depth of twenty to fifty feet.

The great drawback to this district for farming is that it is in what is known as the dry belt and one is never certain of sufficient moisture. This whole block is very well settled and practically every quarter-section of value is either filed on or leased. A large number of the settlers are Germans from North Dakota, but there are also a number of Canadians and Americans. This district has only been homesteaded for about five years; previous to this it was considered a ranching country, and there are still a number of ranchers left. The district has made rapid strides; schools and post offices are to be found in practically every township, while there are some prosperous villages on the main line of the Canadian Pacific railway which runs through townships 11 and 12 across this block. A number of the road allowances are graded and the old trails have become fenced off.



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The future of this district depends almost wholly on the rainfall: with sufficient moisture the district will be prosperous. The crops this year were a total failure on account of the long drought, but, far from being discouraged, the settlers are confident of the future and were making their plans for an increased acreage next year.

There is no wood or fuel in this block, and the only wood available is in the Cypress hills to the south and in the sand hills north of Big Stick lake to the east.

The investigation of this block occupied us until July 24, when I returned to Maple creek and started to work east through townships 11, ranges 26, 25, 24, 23, 22 and 21. These townships are at the foot of the Cypress hills and, with the exception of townships 11, ranges 25 and 26, are highly rolling prairie and are more or less broken by several creeks.

The beds of the lakes in these townships were also found to be dry. A number were producing hay, while others were soft, alkaline mud.

These townships are well settled and are in close proximity to the main line of the Canadian Pacific railway. One very noticeable feature was that as soon as we started east from Maple Creek the crops appeared better, especially the wheat crop.

On reaching range 21 I turned south to township 7, range 20, and worked north through range 20 to Gull lake. The Cypress hills in township 11, range 21, take the form of an escarpment from 200 to 300 feet high. On top of the escarpment the country is gently rolling, but where creeks are encountered the valleys are wide and deep and usually have bush along their sides. On reaching the top of the bench it was at once apparent that the upper level had received more rain than the lower. Hay stacks were to be seen in all directions, while wheat and oats were much better. This part of the country is also well settled, the majority being Americans.

The Weyburn-Lethbridge branch of the Canadian Pacific railway runs through township 8 so that this part of the country is well served with railway facilities. I reached Gull Lake on August 22, having finished the investigation of townships 7, 8, 9, 10, 11 and 13, range 20, and townships 11, 12, 13 and 14, range 19. In these townships a few small lakes were encountered which carry water the year round, but the majority were found to be dry.

From Gull lake we worked east to Swift Current, and completed this block of townships as far south as township 11. We arrived at Swift Current on September-11.

In these townships several permanent lakes were traversed. The most important of these is lac Pelletier, in township 12, range 15. This lake lies in a valley about a mile wide and 150 feet deep, and the lake is about three miles long and from one-half to three-quarters of a mile wide. The water is fresh, cool, and well stocked with fish. The shore is well defined and covered with loose stones. The greatest depth found was thirty feet. A small summer resort was started last summer on the east side of the lake and as the lake is a convenient distance from Swift Current the resort should be well patronized.

Up to the time we reached Swift Current the weather had been very dry and hot, but on September 12 we had a heavy rain which turned to snow and lasted without interruption until the 14th.

The next block of townships investigated was composed of townships 11 to 14 in ranges 8 to 13 inclusive. This block is rolling prairie and is very well settled. The majority of the settlers are homesteaders, but there are still a number of ranchers left. These townships are served by the branch of the Canadian Pacific railway which runs from Swift Current southeasterly to Vanguard in township 11, range 10.

Townships 13 and 14, ranges 12 and 13, are all taken up by Mennonites of Russian nationality. These people live in villages and work their farms from the village. These villages or communities vary from three or four houses to a village with a street a mile long with houses on both sides. Each family have a large house and barn combined and a garden of about five acres. Usually there is a church, school,



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and blacksmith shop. In one of these villages in which I camped they had a concrete tank and windmill supplying running water to all the buildings.

In this block of townships I found no water areas to traverse, with the exception of a small slough in township 11, range 8. The crops in this district were better than those farther west, wheat yielding from five to twenty bushels an acre, the latter on summer fallow. Oats and flax, however, were very poor and very little of it was threshed.

I completed the investigation of this block on September 30 and returned to Swift Current.

My next work was to traverse South Saskatchewan river in townships 22 and 23, range 19. On the move from Swift Current to these townships I was greatly delayed by wet weather. I reached Cabri, a town on the Swift Current-Bassano branch of the Canadian Pacific railway in township 19, range 18, on October 3 and was held up there until the 8th on account of the almost impassable condition of the roads due to the heavy rains. During this time I was able to investigate Boggy lake in this township.

I reached township 23, range 19 on October 9 and commenced the traverse of the river in this township and in township 22, range 19.

The river runs through the southerly part of township 23 and through sections 35, 36 and 25, township 22. It varies from one half to a mile in width and is full of sandbars and islands. Fifteen islands were traversed in township 23 and two in township 22. The largest of these islands is four miles long and half a mile wide while the smallest one is less than half an acre in area. They are mostly covered with a dense growth of small poplar, willow and birch and buffalo berry bushes; in places they have steep cut banks from six to twelve feet high. The valley of the river runs back for about a mile on each side but the slope is gentle and the top of the valley is not more than 200 feet above the river.

The older settlers are ranchers and the new ones homesteaders. The homesteaders however have not been settled long enough to have any crops. I completed the traverses in these townships on October 21, after which I moved to Maple Creek and disbanded my party.

During the season I completed the investigation and traverses in ninety-three townships and partially investigated a number of others. I also erected forty-four monuments which had not previously been located.



## APPENDIX No. 25.

## ABSTRACT OF THE REPORT OF A. L. CUMMING, D.L.S.

## SUBDIVISION SURVEYS NEAR PEACE RIVER CROSSING.

Having completed the organization of my party at Edmonton, we left for Peace River Crossing, near which place my work lay, arriving there on May 11, 1914.

We began subdivision in tp. 83-21-5, as about twenty squatters were located there waiting for a surveyor to accept their statutory declarations. Most of these settlers are located in the southwest part of the township, where there is a plateau about six square miles in area. Peace River Crossing is located in the northwest corner of the township, and the growing importance of this settlement has no doubt attracted settlers to the locality. The small gardens put in by the settlers last year gave good results, and prove that the soil is fertile. Most of the land settled on is covered with light poplar and willow, but it can be easily cleared.

The western portion of the township is cut up by the valleys of Peace and Smoky rivers which are from 500 to 700 feet deep and from one to three miles wide. Peace river is about 1,800 feet wide at the Crossing, and is navigable for steamers.

I also made subdivision surveys in tp. 84-20-5, tp. 82-21-5, tps. 82 and 83-22-5 and tp. 82-23-5, all of which were completed by November 1. The land in these townships is similar to that in tp. 83-21-5, but it is not so eagerly sought after owing to its greater distance from Peace River Crossing.

I returned to Edmonton, discharged all my party except two men and left for Swan River district south of Lesser Slave lake. This is a choice farming district but the best of the land is in the Indian reserves.

After performing some miscellaneous work on Moose, Driftwood and Salteau rivers I returned to Athabaska district, where I made two small correction surveys.

We closed operations for the season on December 20.



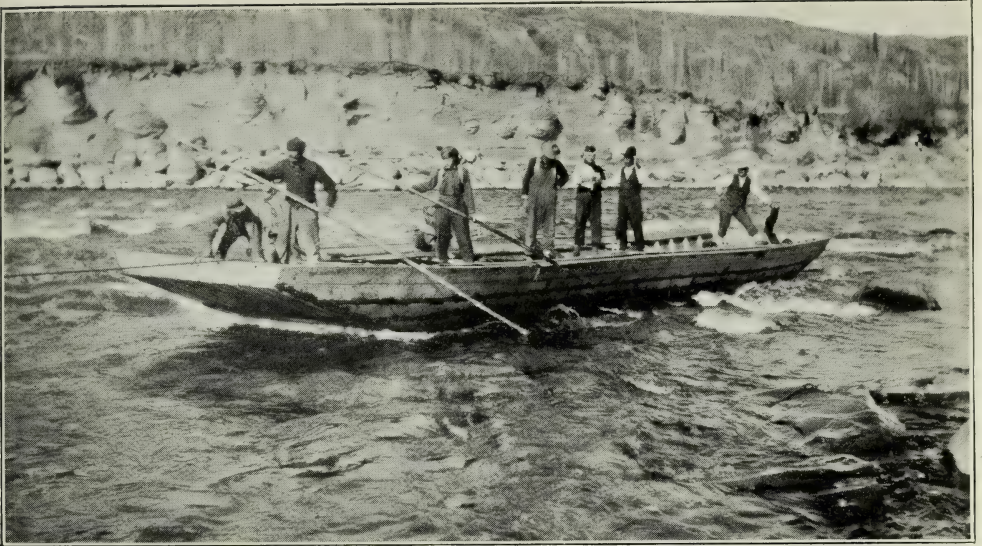


Photo by F. V. SEIBERT, D.L.S.

#### TRACKING SCOW TO FOOT OF GRAND RAPIDS—ATHABASKA RIVER.

After running through the right channel, the scow is caught by the eddy, just below where the two channels meet. A line is attached to a float or log which is thrown into the left channel and after being carried into the eddy is picked up by the crew and fastened to the bow of the scow. The men on the island then pull the scow up to the landing where it is loaded.

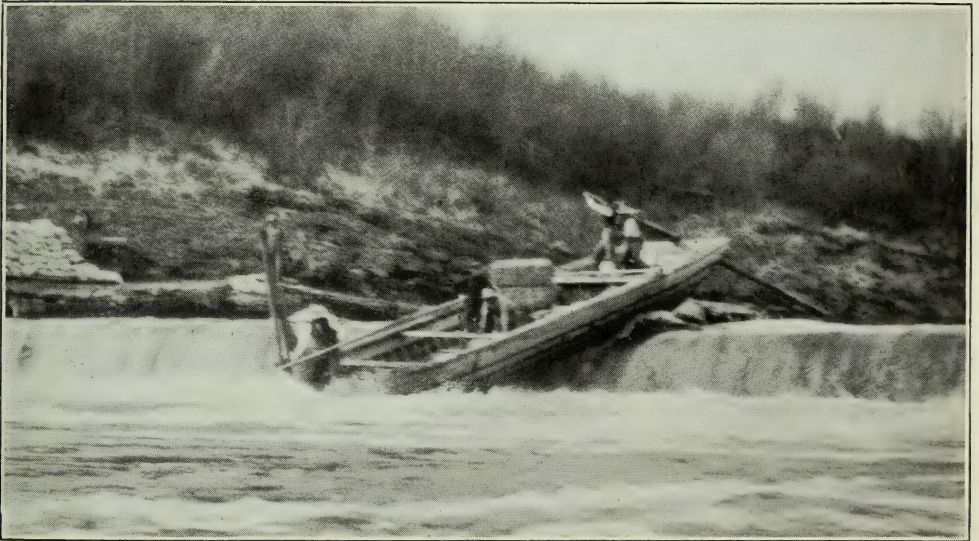


Photo by F. V. SEIBERT, D.L.S.

#### SCOW GOING OVER CASCADE RAPID—ATHABASKA RIVER.

At low water the drop is about six feet and scows have to be unloaded and run over empty. At high water the drop shows only as a large wave, and scows go over the rapids fully loaded. A rope from bow to stern over some bales of hay in the centre, which act as a strut, relieves the strain on the scow, and prevents it from being broken in two.







## APPENDIX No. 26.

## ABSTRACT OF THE REPORT OF W. J. DEANS, D.L.S.

## INSPECTION OF CONTRACT SURVEYS IN MANITOBA AND SASKATCHEWAN.

Our first work, which was begun on March 27, 1914, was the inspection of contract No. 24 of 1913 west of lake Winnipegosis.

On our route thither from Winnipegosis we passed some fine homesteads between Pine creek and Duck bay, in tps. 36 and 37-20-Pr. The surface is rolling and covered with a thick growth of poplar and willow with clear spaces throughout the district. The soil is a rich black loam and well adapted for agricultural purposes. There are many hay meadows which ensure an abundance of feed for cattle, and the water in the streams and sloughs generally is good. There is plenty of fish in the lake and game is plentiful. Employment may be obtained in the winter from the fish companies which prosecute the fish business with great energy.

The lands included in this contract, which lies immediately north of Duck bay, are generally low and flat. There are many muskegs, lakes, and tamarack swamps separated by poplar ridges of fairly good land. The timber on the ridges is only suitable for building purposes and fuel. There are many places throughout this part suitable for cattle raising, hay and water abounding.

This work was completed on April 4. I then disbanded the party and returned to Brandon until after the spring break-up.

On July 11, I left Brandon with a small party for Madge lake, fifteen miles north-east of Kamsack in Duck mountains. My work here was to lay out a summer resort near the southeast corner of the lake. This lake is about three miles in length and about the same in width with numerous deep bays and small islands. In many places there are fine sandy beaches sloping back from the water for a distance of thirty feet. The higher ground is mostly covered with poplar. The crowd visiting this lake is very cosmopolitan in character; they do not all come for pleasure. Many come to fish and are well rewarded for their efforts, and some come to pick raspberries which grow in profusion on the islands. There is a good road nearly all the way from Kamsack to the resort, though the last mile or two is a little rough on account of stumps sticking up above the surface.

From there we went to St. Ambrose a settlement north of Poplar Point where a number of squatters had settled on sec. 11, tp. 15-5-Pr. This section was subdivided in such a manner that each squatter retained all his improvements. The land is very stony except the northwesterly part which is hay land. The squatters are engaged in raising a few head of cattle, and fish and hunt in the winter. I completed this work on August 28 and moved to Grand Rapids where I arrived on September 5, having travelled by steamer from Selkirk.

Our work at Grand Rapids was to survey a number of lots for settlement and to investigate the claims of squatters.

When this was completed we left by steamer for Manigotagan, intending to get off the steamer at Gull harbour or Hecla, but on account of rough weather the captain would not run into these places, so we were carried to Selkirk, where we arrived on October 3.

From there we returned by boat to Little Black river to examine contract No. 27 of 1913, which we completed on October 14, and the next day moved the party to



Manigotagan to examine contract No. 26 of 1913. We completed the examination of this contract on the 22nd. After completing the work at Manigotagan, we had great difficulty getting out, but finally took passage on a tug called the *Amisk* which landed us safely in Selkirk, having taken forty-eight hours to travel about one hundred miles.

On October 30, I went to Portage la Prairie to get my outfit which I had left near there in the spring, and on November 3, shipped it by the Canadian Northern railway to Shellbrook, Saskatchewan, at which place it arrived on November 9.

From there I left with four teams for contract No. 13 of 1911, which we reached on November 22, and completed the inspection on the 26th. We then started out to inspect contracts Nos. 13 and 21 of 1911. These contracts are situated about fifty miles north of Witchehan lake. The Green lake trail runs through one of these contracts, but we found this trail in a very bad state. In addition to carrying oats for the horses, we now had to carry sufficient hay from the Witchehan Lake settlement to do the horses while inspecting these contracts, and as the hay was loose and the trail through the bush very narrow we had considerable trouble and delay.

We completed the inspection of these two contracts on December 15; we intended to go across the country to Meadow lake in tp. 59-16-2, but could not do this on account of the streams and lakes not being frozen hard enough to carry teams. We therefore, had to take the longer trail around by Green lake. The trail on the west side of the lake is so steep that we had to let the sleighs down by means of a rope snubbed around a tree. On the east side of the lake, however, the trail is good. The country is covered with a growth of poplar, birch and willow. The surface is nearly level or gently rolling and the soil is good black loam. There are no white settlers in the district.

We arrived at the town of Green Lake on December 17 and spent one day repairing the racks of the sleighs which had got badly damaged owing to the rough road. We then proceeded to Meadow lake and thence to Beaver river in contract No. 26 of 1912 where we arrived on the 20th.

In addition to the inspection work required in this contract we had to traverse Beaver river through tp. 61-16-3, Meadow river through sections 4 and 9 in the same township, and a small lake in township 60. We completed the inspection and traverses on January 4, 1915.

The country between Green lake and Meadow lake is rolling and covered with poplar on the good land and jackpine on the sandy ridges. There is considerable land through this district suitable for farming purposes and ranching. We did not see many settlers in this part, and what few we did see are engaged in cattle raising. There is an abundance of hay all along Beaver and Meadow rivers which makes this part well adapted for that purpose. Many settlers were engaged in fishing at Waterhen lake during last winter and met with great success, a ready market being found at points along the railway.

On January 5, we started for Mervin in tp. 50-20-2, the nearest point on the railway, and arrived there on the 7th.

Between Meadow lake and Brightsand lake there is an extensive country without many settlers. The surface is gently rolling and covered with poplar, birch and willow with bluffs of spruce and tamarack. There are many open spots and numerous streams and small lakes; hay is plentiful throughout the district. The soil varies from a rich black loam to sandy loam. There is a good supply of building material and plenty of wood. The only drawback is the lack of railway facilities, and this will in all probability soon be supplied.

On January 9, we shipped the outfit to Winnipegosis, and on the 18th left there to re-inspect contract No. 13 of 1912. We completed this work on the 26th, and on the 30th arrived back in Winnipegosis. From there we travelled across lake Winni-



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pegosis and lake Manitoba to tp. 32-13-Pr. We had two small corrections to make in this township, and while my assistant was making these the rest of us were engaged in making a trail to Proulx lake, in township 33, range 13, where corrections were necessary. We moved camp to this township on February 11. This lake is about five miles in length and one half mile in width; the shores are generally low with hay meadows, but in a few places poplar bluffs extend nearly to the water. There is some good land around the lake and any amount of hay. There is also sufficient timber for fuel and building purposes, for many settlers. Fur-bearing animals, such as wolves, mink and muskrats seem to be numerous. While in this camp we examined a portion of contract No. 25 of 1913, and the remainder was examined from a camp in tp. 33-12-Pr. The land throughout this contract is nearly level or slightly rolling and covered with a thick growth of poplar, willow and tamarack, with many hay sloughs and muskegs. There are, however, many sections which are well adapted for cattle raising. The soil is sandy loam on the higher levels and a deep black muck in the lower places. There are many places which could be cleared with very little labour, but there are no settlers in the district, as it is too remote from railways to attract them.

On February 19, we started for contract No. 20 of 1914 by way of Fairford and Gypsumville. This route took us considerably out of our way, but the snow was so deep that a more direct way was impracticable. We arrived at tp. 34-9-Pr. on the 23rd. Between Gypsumville and the southerly boundary of this contract there is a large area of good land. The country is gently rolling and covered with a thick growth of white poplar from six to eighteen inches in diameter, very tall and straight. The soil is a good black loam; this area of good land extends to about the middle of township 34, range 9. Most of the land in this district has quite recently been taken up, but there are still some good quarters suitable for cattle raising. The settlers have until recently found a ready market for cordwood at Gypsumville, but on account of the depression there was very little sale of wood this season: this, however, did not deter many of them from making extensive clearings which they no doubt intend to crop.

On February 28, we moved the outfit to Gypsumville, and on March 2 shipped part of it to Riverton and part to Lac du Bonnet.

At Winnipeg I divided the party, sending my assistant with some of the men to Lac du Bonnet, from which place they went to Bird river by sleigh, and examined contract No. 28 of 1913. I went with the remainder of the party to Riverton, thence by sleigh up lake Winnipeg to contract No. 21 of 1914. We inspected this contract, and on March 15 moved to Winnipeg and met the rest of the party from Bird river.

The land in contract No. 28 of 1913 is largely rock ridges, with tamarack swamps, hay meadows and small lakes, but there is some timber suitable for building purposes and cordwood.

The land in contract No. 21 of 1914 is generally level and covered with a thick growth of poplar, tamarack, birch and willow. There are many good homesteads along the shore of lake Winnipeg. In places the land is nearly clear so that little labour would be required to bring it under cultivation.

Riverton the terminus of the Winnipeg Beach branch of the Canadian Pacific railway is quite a thriving place and is the station to which many of the fishermen bring their fish for shipment to Winnipeg. About four hundred cars of fish were shipped from this station last winter.

On March 17, we started for Mafeking to inspect a contract in that vicinity. In addition to the inspection work we made a traverse of Moose creek and Steeprock river. This work was completed on March 27. I then proceeded to Dauphin where the party was discharged. Steeprock river rises in the Porcupine mountains and flows easterly through tp. 44-25-Pr. This stream spreads out and is lost in willow and



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tamarack swamps; it probably finds its way into Moose creek by underground channels, and by two visible outlets from a large marsh on sec. 10, tp. 44-25-Pr.

The waters of Moose creek in many places are highly impregnated with salt, so much so that if a stick is dipped into it and withdrawn it will be found to be encrusted with fine white salt. The bushes along the stream in many places are white where they come in contact with the water. There are some good homesteads available along the line of the Canadian Northern railway near Mafeking. The land is covered more or less with bush, but it is good black soil and much of it dry, and could be cleared with little labour.

The bush lands of Manitoba around the lakes offer the settler good inducements, such as good land, any amount of fuel and building material, and abundance of hay, good water and plenty of large game. In winter time employment may be obtained from the fish companies or in logging camps.

My work took me over an extensive area of the western country, and I noticed that the settlers around the lakes were in the most prosperous condition.

The weather conditions last winter for carrying on field operations were good, not too cold and little snow except around the lakes.



## APPENDIX No. 27.

## ABSTRACT OF THE REPORT OF S. L. EVANS, D.L.S.,

## MISCELLANEOUS SURVEYS IN SASKATCHEWAN.

The miscellaneous work on which I was engaged during the season of 1914 consisted of the laying out of roads at Madge lake, the subdivision of lots at Clear lake, the resurvey of tp. 39-13-3, tp. 16-21-3 and tp. 23-23-3, and several small surveys in the Coteau hills.

Madge Lake summer resort lies on the south shore of Madge lake, about twenty miles northeast of Kamsack, Sask., a thriving town of 1,200 inhabitants on the main line of the Canadian Northern railway. The country in the vicinity of this resort is well timbered with small spruce and poplar. A partly graded road runs from Kamsack to the lake, but the last eight or ten miles of it is a bush trail which has only recently been widened out by the forest ranger stationed at Madge lake. It is the intention in the near future to grade this latter part of the road, and when completed there will be a first-class road from Kamsack.

Clear Lake summer resort, which we next subdivided, is located in sec. 33, tp. 19-19-Pr., and lies on the west shore of Clear lake. The nearest station is Erickson, a small village on the Neepawa-Russel branch of the Canadian Northern railway. The lake is about twenty miles northwest of Erickson, and is connected with it by a fairly good summer trail. It is a beautiful clear body of fresh water five or six miles in width and abounds with whitefish and pike.

Our next work was the resurvey of tp. 39-13-3. This township lies about thirty-five miles northeast of the town of Perdue, Sask., and is in the Eagle hills. The township on the whole is very hilly and wet, having numerous small sloughs and lakes, and is for the most part covered with dense small poplar. A few of the homesteads have been taken up and where crops have been put in, wheat and vegetables have grown successfully. Most of the lands owned by railway companies are still vacant. The country to the east of this township is an excellent grain-growing district, and contained the best fields of wheat seen during the season.

On completion of the above township, we drove across country to tp. 16-21-3, a distance of over two hundred miles. On the trip we passed by way of Perdue, Harris, Rosetown, Alrose and Saskatchewan Landing.

The country as far as Rosetown is settled with a good class of settlers, and the splendid farm buildings evince prosperity. From Alrose to Saskatchewan Landing, a distance of forty-five miles, the district has been partly homesteaded in the last few years. The crop this year was almost a complete failure, having suffered from the continual drought throughout the summer.

The work in township 16, range 21, was completed August 27, and our next work was the resurvey of tp. 23-23-3. South Saskatchewan river touches the north-west corner of this township. Two-thirds of the township is hilly prairie, and most of the best homesteads have been taken up. The new Empress branch of the Canadian Pacific railway affords good shipping facilities for the settlers. This year the crops were poor on account of the drought, which was general throughout the southwestern part of the province.

This work was finished on September 21, and the dry bed of Luck lake in township 24, ranges 8 and 9, was next subdivided. This lake, which has dried up in the



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last few years, is covered with a thin coating of alkali. Grass is gradually covering the lake bed, and in time these lands will make pasturage and hay lands. The surrounding district is well settled, and grain growing is successfully carried on, but only a half crop was obtained this year. A new branch of the Canadian Northern railway running south from Macrorie through the Luck lake country is being built and will give the farmers better shipping facilities.

From October 5 to the 17th, we were engaged on several small miscellaneous surveys in township 26, range 8, townships 25 and 26, range 9, and township 26, range 10. These townships are all in the Coteau hills, and for the most part are hilly prairie. Most of the best quarters have been taken up, and good crops have been grown; this year the crop was only fair. I closed operations and returned to Calgary on October 31.



## APPENDIX No. 28.

## ABSTRACT OF THE REPORT OF S. D. FAWCETT, D.L.S.

## SETTLEMENT SURVEYS IN THE NORTHWEST TERRITORIES.

The settlement surveys on which I was engaged during the summers of 1913 and 1914, lie along Athabaska river, Great Slave lake and Mackenzie river.

Having completed our organization at Edmonton the party proceeded by rail to Athabaska and thence by a ten-ton scow down the river to McMurray, reaching the latter place on May 19.

As one travels north from McMurray the high hills gradually dwindle away and finally disappear as lake Athabaska is reached. The country south of the lake is an unbroken swampy plain as far as one can see. The north shore is rocky.

What we saw of the north shore of lake Athabaska is rock, and there is very little land close to the lake which is fit for agricultural purposes. As we entered Rocher river however the country assumed a different aspect, and some large stretches of partly open rolling land were noticed. We passed there on June 1 and the grass was even then from two to three feet in height. This land is available for ranching or farming purposes and is easy of access.

We had to row our scow forty miles down Rocher river as the water from Peace river was beginning to back up into lake Athabaska. It is not uncommon to have to track a scow down Rocher river about the first week in June. If the right bank of the river is followed at the points where rapids are shown on the maps, no danger to navigation will be encountered. In fact except for sand-bars and occasional blind channels no guide is necessary from McMurray to Smith Landing.

Slave river runs about four miles per hour and averages three-quarters of a mile in width. Its banks, excepting between Smith Landing and Fort Smith, vary in height from fifteen to thirty feet and in general are wooded with poplar and spruce. At intervals scattered clumps of spruce large enough for lumbering purposes were observed. The top soil exposures are generally a light clay loam and beneath this is a heavier clay loam subsoil. Smith Landing, where we arrived on June 4, is approached by following the left bank of the river from a point about three-quarters of a mile above it, as there is a strong rapid just at the settlement which nestles at the base of the high crescent-shaped hill.

A scow can be run down the numerous rapids on Slave river between Smith Landing and Fort Smith but we chose rather to portage everything by wagon as it eliminated the chance of losing our goods. It also saved time as several of these rapids necessitate the portaging of scow and goods, and at Mountain rapid the scow has to be hauled up a hill one hundred feet high by means of horses with block and tackle.

The road between Smith Landing and Fort Smith, about sixteen miles in length, is first class and freighters haul from twelve to twenty-five hundred pounds at the rate of three-quarters of a cent per pound.

Both Smith Landing and Fort Smith will no doubt soon be thriving towns, as all the land in the neighbourhood is very good, and it has been amply demonstrated that grain can be raised there successfully. Smith Landing will then form the landing and Fort Smith the shipping point for goods going north, while the opposite will be true for outgoing products. Power can be readily obtained from the rapids. It might also be worthy of mention that the Hudson's Bay company have a telephone system between



these two settlements. Fort Smith is the head of continuous navigation to the Arctic ocean a distance of about fifteen hundred miles. The Hudson's Bay company have a stern-wheel freight and passenger steamer called the *Mackenzie River*, which draws about four and a half feet of water when loaded. This boat navigates the river very successfully and is seldom grounded. The Northern Trading company have a one-screw steel-framed steamer called the *Northland Trader* which carries freight and a few passengers, but as she draws six feet of water when loaded considerable difficulty is experienced in low water in navigating the shallows on Mackenzie river. This latter company have also two small tug steamers which operate on the Mackenzie. The *Mackenzie River* steamboat on her first trip leaves Fort Smith about June 25 and goes to Fort Macpherson. On her second trip she leaves Fort Smith about the first week in August but goes only as far as Good Hope. The *Northland Trader* usually manages to leave a few days prior to the Hudson's Bay company's boat, but goes only to Arctic Red river. She also makes two trips during the navigation season which commences about the middle of June and ends generally in the latter part of October.

We left Fort Smith too early for either of these steamers and had drifted down Slave river about sixty miles when we were overtaken by a fishing tug travelling to Resolution. We were fortunate in getting a tow from her and reached Resolution on June 13.

Farming on a small scale is undertaken there by the members of the Roman Catholic mission and they have been able to raise wheat and oats successfully. All vegetables excepting tomatoes and melons are as easily grown as elsewhere, attain a good size and are of good quality. They have also a small herd of cattle and as considerable improvements have been made, we laid out the land for which they asked. They have also a well equipped saw-mill about four miles north of the settlement on Slave river, from which they ship shingles and lumber to their various stations on Mackenzie river. The remainder of the squatters are engaged in gardening only, so the lots were laid out of sufficient size to meet their requirements. The settlers are mostly half-breeds and Indians who gain their livelihood by net, trap and gun. There is also a detachment of the Royal Northwest Mounted Police established at this post.

We had not completed the survey of the settlement when the steamer arrived at midnight June 30, but we struck camp, rushed our things on board our scow and were soon in tow of the *Northland Trader* across the crystal waters of Great Slave lake.

This immense lake teems with the finest whitefish and lake trout that can be found anywhere. Other species such as inconnu (so-called by the discoverer of Mackenzie river; who named them "inconnu" or "unknown"), pike, pickerel, grayling and sucker are very numerous. Whitefish weigh from three to ten pounds, and trout, inconnu and pike from three to fifty pounds. On account of the water always being ice cold their flesh is very firm and is excellent food. No doubt some day as transportation becomes easier the fishing industry will be developed.

A sandy beach forms the south shore of Great Slave lake and there is a little fringe of land close to the lake front which is fit for agriculture, but this rapidly merges into muskeg which will be of no commercial value till drained. The north shore is said to be rocky, gardens being made by the arduous labour of wheeling earth from wherever it may be found and spreading it out over the rocky surface.

There are deposits of galena located about thirty-five miles southwest of Resolution and about eight miles inland. They are reached by a very marshy trail in which one sinks knee-deep at every step. These deposits occur in limestone formation and will yield from five to ten per cent. Copper has been found on Big Island about halfway between Resolution and the eastern end of the lake. Perforated limestone containing pockets filled with a yellowish oil which burns freely, is often picked up on the shores of the lake and of Mackenzie river. Between the headwaters of Mackenzie river and the north arm of the lake there are considerable deposits of tar asphalt.



## SESSIONAL PAPER No. 25b

On July 1 we arrived at Hay river where the steamer stopped a few hours to unload merchandise and then departed for the north. Wrigley harbour at the west end of Great Slave lake was reached at midnight of the same day and the steamer anchored till daybreak, as great care was necessary there in following the tortuous shallow channel. As it was, the boat ran aground soon after starting and remained aground most of the summer, so we continued our journey alone.

The Mackenzie is noted as one of the largest and grandest rivers in the world. Its waters are clear till they mingle with the muddy waters of Liard river at Simpson where they become a dirty greyish colour and remain so to Good Hope, our journey's end. Whitefish, pike, inconnu, pickerel, grayling and sucker are plentiful, while trout are numerous at Wrigley harbour. From that point the fresh-water herring run in shoals during the months of July and August and these are excellent food. The width of the river varies from one-half to two miles, but some of the lake expansions are much wider. The current seldom falls below four miles per hour and frequently attains a rate of eight miles in what might be considered rapids.

We passed Providence at midnight on July 2 and drifting on down the river arrived at Simpson on the afternoon of the 5th. We remained there till July 28 making a survey of the settlement. Simpson, in north latitude  $61^{\circ} 52'$  (approximately), is situated on an island at the mouth of Liard river. There is a surface soil of rich sandy loam generally eighteen inches in depth with a sandy clay subsoil. A large area of land, which will no doubt be of commercial value before many years, extends up Liard river into British Columbia. After many trials it has been amply demonstrated that oats can always be grown and that wheat is sure three times out of five, although it is liable to be slightly frosted. Vegetables do exceedingly well. Mr. Harris, the Indian agent there, informed me that in the fall of 1913 he took one hundred and twenty bushels of fine large potatoes from one-third of an acre of land. Tomatoes and melons can be raised, but it is necessary to start them under glass. Small fruits such as raspberries, blueberries and cranberries can be had in abundance throughout the Mackenzie district. The winters are long and severe, but on account of the length of the summer days plant growth is very rapid and, as no frosts occur till well on in August, plants are almost certain to attain full growth. There is always sufficient rainfall to maintain the crop. The Department of Indian Affairs have a saw-mill established there, which is proving a great benefit to the settlers as it supplies them with shingles and lumber at a small cost.

We laid out thirty-eight lots of various sizes according to the needs of the settlers, and I do not think there will be any further surveys required for some time unless a gold rush occurs.

In the spring of 1914 a French prospector took a scow load of miners' utensils and supplies up Liard river from Simpson to commence operations on a gold claim he had discovered during his explorations there in the summers of 1911 and 1912. He was accompanied by four helpers but we could not find out where the deposit was located or of what extent it was.

About eighty miles below Simpson the general westerly direction of the river turns abruptly to the north where the Nahanni mountains, a spur of the Rockies, bars its westward progress. There the river seems to have cut its way clean through the mountains and two gigantic rocky cliffs resembling Gibraltar stand guard over the unexplored treasures of North Nahanni river. From that point northward the scenery along the Mackenzie becomes much more beautiful.

We arrived at Wrigley on July 30, having spent thirty-six hours on the trip from Simpson, a distance of one hundred and sixty miles. This settlement is merely a trading post and no attempt whatever has been made at farming, the squatters contenting themselves with the garden produce they raise. We therefore laid out only small lots to cover the claims of the traders and half-breeds and a few additional lots to cover any future claims. The people there are all half-breeds and Indians.



We left Wrigley on August 12 for Good Hope, as we had decided to survey that place next and track back up the river to Norman, thereby saving the expense of dog trains from Good Hope to Norman. The evening of August 12 we experienced a sharp frost.

On August 15 we passed Norman, where we cached supplies for our return. Good Hope, the most northerly point of our trip, was reached on August 18 after a week's travelling, the distance from Wrigley being close to three hundred and forty miles. During our whole trip down the Mackenzie, we encountered no obstacle to navigation. There are two rapids between Norman and Good Hope: the first one is the Sans Sault, which is run by following the current of Carcajou river that comes in from the west just at the head of the rapid. The other is Rampart rapid, which is easily run by keeping close to the right bank of the river, so close in fact that one could almost jump from the scow to the mainland. As this latter rapid is approached, high perpendicular sandstone cliffs apparently hem the river in on all sides. However, upon rounding a bend or two, walled with these towering cliffs, Good Hope appears high up on the hillside, its whitewashed buildings gleaming brightly in the sunlight.

Even at this settlement, on the verge of the Arctic circle, we found thriving gardens in which potatoes, onions, lettuce, rhubarb, turnips and carrots were growing. No farming has ever been attempted so we laid out lots of sufficient size to meet the requirements of the settlers. We also surveyed a lot containing one hundred and twenty-one acres to meet the demands of the Indians, of whom there are about six hundred trading at this post. The work we have done there will be sufficient for many years.

While we were there an Indian brought in a piece of native copper that he picked up on Loon river which flows into the Mackenzie twenty-five miles north of Good Hope.

We had a snow-storm on August 31 and also experienced considerable wet weather in the first two weeks of September.

Throughout the north moose, caribou, and bear are plentiful but it is necessary to go back some distance from the river to hunt. Mountain sheep and goats roam the mountain slopes, while ducks, geese, ptarmigan and partridges can be obtained with but little effort during the summer season. Fish of course are to be had in abundance if one carries a net of three and a half inches mesh.

We left Good Hope on September 18 and tracked our two canoes up the river to Norman where we arrived on September 30. This settlement is situated at the mouth of Great Bear river. There, as at all the settlements we visited, the only white people we found were the representatives of the two missions and the clerks of the Hudson's Bay and Northern Trading companies. These usually comprise about five per cent of the squatted population.

The only grain grown there to my knowledge is barley, the summer season being too short for wheat and oats to mature. The white people have small gardens, and the Indians depend for their livelihood on trapping, hunting and fishing. We laid out twenty-six small lots and a larger one to serve as a reserve for the Indians.

The country between Norman and Gréat Bear lake is largely muskeg which extends close to the settlement, Norman itself being located on a fringe of dry land between the edges of this muskeg and the banks of Great Bear and Mackenzie rivers.

Great Bear lake is open during the latter part of July, August, September and October of each year. Its waters are alive with magnificent lake-trout, whitefish and herring, besides other less valuable species. Countless number of caribou roam the "barren lands" which surround the lake, and the Indians still hunt them down with bow and arrow.

There are deposits of native copper in the vicinity of this lake, at Dismal lakes and on Coppermine river. Mr. John Hornby, an English explorer, who has spent the past seven years on the barren lands, gave me a sample of this copper which he picked up on Coppermine river.



## SESSIONAL PAPER No. 25b

Great Bear river can be ascended in July and freezes over about November 10, but on account of drift ice canoes are useless after the third week in October.

About twenty-five miles up-stream from Norman on the left bank of the river, there are deposits of lignite of good quality. There is also another seam a short distance above this post which is on fire and has been smouldering away for many years. We also heard that a short distance down-stream from Norman crude oil could be seen oozing out of the ground at low water but as we did not pass it at the right time of the year, we were not able to observe this ourselves.

Mackenzie river was frozen over completely by November 18 and on November 25 we left Norman with three dog trains for Wrigley. On account of the strong current between Norman and Wrigley it is the last portion of the river to freeze over and the drift ice from above comes down and piles up, forming a terribly rough and jagged surface for dog teams to travel upon. In fact we had to cut many miles of trail for the sleds through this rough ice, and upon several occasions we ran into ice walls four feet thick and fully eight feet in height. Our progress was necessarily slow, but we at last reached Wrigley on December 4. By the latter part of December the snow covers up most of these rough parts and the journey can be made in six days, which is the usual time taken by dog trains between posts.

We waited at Wrigley till December 9, when the dog trains arrived from Simpson as had been previously arranged. After one day's rest, these trains carried us to Simpson, where we arrived December 16, in time to catch the outgoing mail to Athabaska, which left December 17.

In this north country the winters are long and during January and February the cold is intense. On one occasion the thermometer registered 58 degrees below zero, Fahrenheit, and frequently during the day it was 40 degrees below. The Indian agent utilizes the winter months for logging purposes and he is provided with two teams of work oxen. Hay for their use is obtained up Liard river a short distance from the post. I understand it is not so long since the Hudson's Bay company had a fairly large herd of cattle at this post which was at that time the headquarters of the company for the Mackenzie River district. North of Simpson there is a very small quantity of timber fit for lumbering purposes but to the south and up Liard river there are large areas covered with timber of commercial value. The Royal Northwest Mounted Police, who now have a detachment established there, are aiding the fire patrols and, comparing the summer of 1914 with that of 1913, we noticed a very large decrease in forest fires.

During the latter part of February and beginning of March we traversed a portion of Liard river and laid out a reserve for the Indians about Simpson. This was done at the request of Mr. Harris, the Indian agent.

It is difficult to obtain dog trains during the months of January and February, as the Hudson's Bay company have their trains carrying mail and making inspection trips between posts while the Indians are away on their hunting expeditions.

Early in March I sent my assistant and three men ahead to Hay river, and after the March mail came into Simpson, followed them as far as Providence. By dividing the party we were able to utilize the time from May till the third week in June, when, on account of the spring break-up, it is impossible to travel on the Mackenzie. We occupied this time in surveying and mounding the two settlements.

The land at Providence is fairly good and we accordingly laid out a few large lots in case any person should care to farm the land. Oats and barley are grown successfully here, but Father Giroux, in charge of the Roman Catholic mission, says that wheat seldom gets beyond the milk stage. We also laid out a large lot which will serve as a reserve for the Indians who visit the post. The Roman Catholic mission has a convent there and are educating the Indian boys and girls from all parts of the country to the north. They have also a small herd of cattle. Hay is found in abundance in the vicinity of the fort, and is of good quality as was testified to by the



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excellent condition in which we found the cattle after the long tedious winter. The remainder of the lots were laid out as garden plots and sufficient were surveyed to last for some years.

At Hay river two large lots were laid out, one for the Anglican mission and the other for the Indians. The other lots were laid out to take in the claims of the various settlers and each settler was given land according to his requirements. We laid out thirty-two lots in all which I think will be sufficient for at least ten years.

The land bordering on Hay river and on Great Slave lake consists of a fertile sandy loam and the gardens produce splendid vegetables. Wheat and oats have been successfully grown. Settlers have been able to seed the land as early as the first week in May, and on account of the long summer days plant growth is very rapid.

The climate throughout the north during the summer is ideal and not liable to sudden change. It becomes very warm during July and August. There is just enough rainfall to keep the ground in excellent condition for grain or vegetable growing. The wet season seems to extend from the latter part of August to the middle of September and frosts are then of frequent occurrence.

Fifty miles up Hay river from the settlement the Alexandra falls are to be found. The main fall is one hundred and six feet in height, and the lower fall forty-six feet. At the main fall the river runs between limestone cliffs, and power can be easily developed when necessary. There is a lot of good land bordering on Hay river, and it becomes better as one journeys up the river. Just above the main fall there is a fine park-like country to be seen.

We left Hay river June 30, 1914, and crossed Great Slave lake by canoe to Resolution, arriving there at midnight on July 2. We completed the survey of this settlement on July 28, and next day caught the steamer *Mackenzie River* for Fort Smith where we arrived on the 31st.

At Fort Smith we learned that engineers had been busy running location lines for a tramway between Fort Smith and Smith Landing so that in the near future there will evidently be a quicker and cheaper method of transportation than there is at present. I understand that most of the surveyed portion of Smith Landing and Fort Smith has been taken up so that there will be additional survey work required around these places in a short time.

We left Smith Landing on August 4, on board the steamer *Grahame* and arrived at McMurray on the 9th. We then hired two pack-horses and took the overland trail to House river arriving there August 14. We passed through some fine ranching country portions of which were suitable for farming, especially as we approached House river where we found subdividers at work.

We then loaded our outfit on board the gasoline launch which plies twice a week between Athabaska and House river and reached Pelican settlement at dark on August 15. We there subdivided the front portions of lots 8 and 9 into village lots, which work completed our operations.



## APPENDIX No. 29.

## ABSTRACT OF THE REPORT OF J. A. FLETCHER, D.L.S.

## BASE LINE SURVEYS IN NORTHERN ALBERTA.

On April 8 I left Edmonton and travelled by rail to Sawridge, and thence by winter trail to Peace River Crossing where I arrived on April 20, 1914.

The outfit and supplies were loaded on scows which had been constructed for us, and the trip down Peace river was begun on April 26. At Carcajou point, which we reached on the 28th, enough supplies to last the party about two months were cached. The remainder was sent down to Fort Vermilion. The pack train which had been wintered west of Fort Vermilion met us at Carcajou point and we immediately moved to the starting point of our work in range 17.

The survey of the 26th base was commenced on May 1 and continued easterly without interruption till we reached range 9 on June 22. As the supplies were by this time running short this part of the work was discontinued for the time being, and the party and outfit moved north to the 27th base.

Arrangements had been previously made to have the supplies which had been sent to Fort Vermilion taken up Wabiskaw river as far as possible. Owing to the low water the highest point reached was about six miles north of the 27th base line. A cache was built at this point.

The survey of the 27th base was commenced in range 9 on June 25. Immediately after leaving the Wabiskaw very swampy country was encountered over which it was impossible to use pack-horses. Consequently the pack-trail was run east from the cache which had been built on the Wabiskaw as far as Mikkwa river, where access to the line was again possible by pack-train. At this time twenty-one pack outfits were burned, and until they had been replaced from Fort Vermilion, the survey proceeded somewhat slowly. The line was completed to the Fifth meridian on August 24, and on the 25th the return trip to the 26th base was commenced.

Work was resumed on this base on September 3 and continued without interruption till the meridian was reached on November 2. The north boundary of fractional range 25, west of the Fourth meridian was then surveyed, and the mounding entirely completed on November 4.

Our trail out, was by way of the Burnt lakes, Chipewyan lake and Wabiskaw to Sawridge, where we arrived on November 30. From there we took the train to Edmonton where the party was paid off.

The weather during the season was delightful, the warm period experienced at the commencement of the survey continuing without interruption till its completion. Considerable rain fell during the year, and on account of the moisture combined with the warmth, the spring growth was early and rapid. The daily growth of grass on the western slope of Buffalo Head hills was quite marked during the second week in May, and by the middle of May the grass in range 15 was a foot high. The horses were fed in this range till the camp was moved out of reach, and no more grass even of average quality or quantity was found till the survey reached Wadlin lake. Some good grass was found on the east end of this lake in range 10. However, the good feeding of range 15 and the absence of flies in quantity at that time, put the horses in good enough condition to carry them across the succeeding interval of coarse and scanty feed. There are some excellent meadows along Wabiskaw river especially from township 102 north. Horse feed along the 27th base line was excellent. Numerous creeks along which were old beaver workings provided rich bottoms for luxuriant grass and peavine. In spite of the fact that the flies were exceptionally bad during the months of July



and August, the horses gained sufficiently, so that the majority came through the succeeding months of poor feed and heavy work successfully.

On the return of the party to the 26th base in September, the frosts soon reduced the quality of the grass, which was not in quantity to render foraging easy. In October it was all frozen and dry, and an interval was crossed in ranges 4 and 3 where there was no feed. The trail at this time was difficult, and the older horses fell off badly. Three of these died on the trip out, but as there was good feed along the trail all the way to Sawridge, and as oats and hay were available in places, twenty horses survived.

During the season, three canoe trips were made down the Wabiskaw to Fort Vermilion for oats, extra supplies and mail. This work relieved the strain on the pack-train, rendering the completion of the survey possible before the beginning of winter. Two men were required to manage the canoe.

In high water canoes could be successfully used on Mikkwa river, but in low water the numerous rapids make travel very difficult.

The country on the 27th base is quite level, the interval between Wabiskaw and Mikkwa rivers, and also the territory for about ten miles east of the Mikkwa being subject to very little drainage. The ridges are merely slight elevations on which the growth of poplar and spruce is possible on account of the ground being heated, in the absence of standing water. They are therefore ridges of timber rather than rises in the ground. With the exception of some large scattered spruce growing along Mikkwa river, very little timber of milling size was seen on this line. The district I believe would be suitable for agriculture, but on account of the swampy nature of the ground and the difficulties of transportation, there is at present very little inducement for settlement. Ranges 1 to 5 are not so swampy as ranges 6 to 9, but are more difficult of access.

On the 26th base line, ranges 16 and 17 lie at the base of the western slope of the Buffalo Head hills. There is sufficient slope for the country to be well drained by numerous creeks. These ranges would make good agricultural land as would also parts of range 15, where the country is more rolling. Windfall and *brulé* at present cover most of this country. From range 14 to Wabiskaw river, the country is more or less rolling with intervals of muskeg. The soil of the rolling country is mostly light as is indicated by the extensive growth of scrubby jackpine. Wadlin lake is crossed in ranges 11 and 10.

Range 9 is quite broken by Wabiskaw river, which curves around the eastern limit of the Buffalo Head hills. A small creek which drains Wadlin lake crosses the 26th base in a deep rock-bottom ravine and flows into the Wabiskaw just south of the base line. On account of having a fall of approximately 1,300 feet in a distance of about six miles this stream resembles a mountain torrent in places and considerable water-power could be developed, due more to the head of the water, however, than to the volume of discharge. In the neighbourhood of the Wabiskaw there is considerable timber of milling size both east and west of the river. Farther east along Mikkwa river and again on Burnt river some large spruce is to be found. This could be easily carried to Peace river during high water.

From the Wabiskaw eastward to the Fifth meridian the country is quite flat or gently undulating. Mikkwa river flows in a valley from a quarter to half a mile wide and from fifty to eighty feet lower than the surrounding country. The country back from the valley appears capable of being drained and afterwards would make good agricultural land. However the drainage problem is a large one and for this reason settlement will likely be slow.

Moose seem plentiful in this district especially over the Buffalo Head hills. Bears are numerous along Wabiskaw and Mikkwa rivers. Fur-bearing animals are numerous, consisting of beaver, foxes, martin, wolves, lynx, rats, etc.



## APPENDIX No. 30.

## ABSTRACT OF THE REPORT OF W. A. FLETCHER, D.L.S.

## STADIA SURVEYS IN CENTRAL SASKATCHEWAN.

The district from Swan River to Yorkton, through which we travelled to reach our work, for the most part is settled by Dukhobors and Galicians, with some Russians and Austrians. The majority of the Dukhobors live under the community system, where all profits and products are turned into one general coffer, whence each in turn receives his allotted supply. Quite a large percentage, however, live independent of the communities on their own homesteads.

This section is largely covered with a thick growth of poplar from four to six inches in diameter, and has innumerable sloughs and ponds of all sizes. As the settlement is recent most of the road allowances are impassable, and good or even passable trails continuing more than five miles in any direction are hard to find.

Our work consisted in the investigation of water areas in the vicinity of townships 25 to 27, ranges 11 to 14, west of the Second meridian. Most of the townships in this district are well settled, and a fair percentage of the land is under cultivation. Most of the land is rolling with scattered bluffs of poplar. Small lakes are quite numerous.

Speaking generally of the whole district, the settlers are rapidly turning towards mixed farming. More hay, oats and barley are being grown each year instead of wheat. Dairying is also becoming an important industry, many large herds of milking cattle being observed.

Owing to an unusually dry summer the grain crop was only about forty per cent of the average of more favourable years. The potato crop, owing to drought and a heavy frost early in August, was almost a complete failure.

I closed operations and disbanded the party on October 17.



## APPENDIX No. 31.

## ABSTRACT OF THE REPORT OF L. E. FONTAINE, D.L.S.

## INSPECTION OF CONTRACTS IN NORTHERN ALBERTA.

I organized my party at Edmonton and from there proceeded to Whitecourt, in tp. 59-12-5, where I arrived on September 27, 1914. Contract No. 18 of 1913, which I completed inspecting, lies in the immediate vicinity.

We then returned to Edmonton, and on October 7 left for Spirit River. There I mapped out the work for the first part of the season consisting of the inspection of four survey contracts, one in Grande Prairie district and three near Peace River Crossing. This kept the party busy until February 16, 1915.

The weather during the survey was fine. The fall was dry and the winter mild with a very light snowfall.

The routes followed were the main ones of the respective districts. The Edmonton, Dunvegan and British Columbia railway runs mixed trains to McLennan on Round lake, and steel is laid to within twenty miles of Peace River crossing. When this road is completed a twenty-four hours' journey will take one from Edmonton to the Crossing, whereas in the past it has taken about twenty days.

We returned to Edmonton on February 25, and on March 1, I left for McMurray to inspect four contracts in that vicinity. At this place the work was carried on with sleighs till the spring break-up and then by pack-trains and canoes.

The McMurray district has not shown as much development as the Peace River, although it has natural gas, tar sands and water-powers. Telegraphic communication has been established between Edmonton and McMurray and the contractors of the Alberta and Great Waterways railway expect to have the two places connected by rail in February, 1916. This will prove a great impetus to the development of the district. About one hundred tons of asphalt from deposits near McMurray have been shipped to Edmonton, where it is being given a trial on road making.

I closed operations for the season on June 4, 1915.





Photo by F. V. SEIBERT, D.L.S.

#### RE-LOADING AT FOOT OF CASCADE RAPID—ATHABASKA RIVER.

This shows the method of handling supplies where the distance is not great. Each article is passed along a chain of men from one to the other until it reaches the scow where it is stored away by three or four extra men. In this way six ton of supplies were unloaded, the scow run over the cascade, and re-loaded in forty-five minutes.

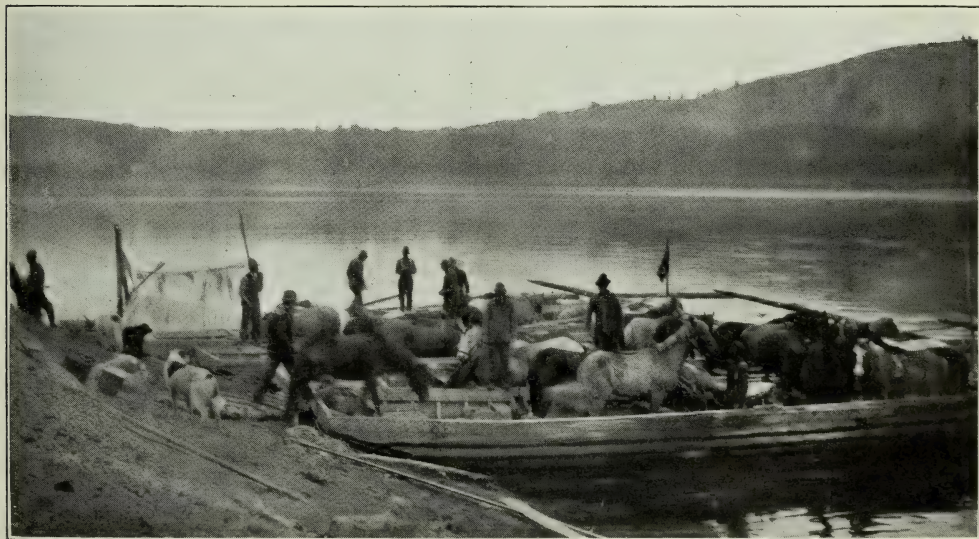


Photo by F. V. SEIBERT, D.L.S.

#### LOADING HORSES ON SCOWS AT McMURRAY—ATHABASKA RIVER.

The horses are taken overland from Athabaska to this place, as the rapids on the river between these two points make transport of horses by scows risky. Below McMurray there are no rapids and no trails, which render transport of horses by scow both possible and necessary. From eight to twelve horses and three to four ton of supplies are placed on each scow. The horses are unloaded every night and re-loaded in the morning owing to the cold nights. These horses travelled 110 miles in this way without accident.







## APPENDIX No. 32.

## ABSTRACT OF THE REPORT OF J. S. GILLETLY, D.L.S.

## SUBDIVISION IN NORTHERN MANITOBA.

My work consisted of subdivision surveys along the Hudson Bay railway from the vicinity of Pas, north to tp. 64-14-Pr.

We left Pas on July 9, 1914, and travelled by construction train to mile 93, which was in the vicinity of the most northerly part of our work.

For transport outfit we used a small velocipede and a standard push car, and to this I later added a hand car, as I found we could save considerable time going to and from work by its use.

We continued surveying in ranges 14, 15 and 16 until September. We then returned to Pas to make some surveys in townships 56, ranges 26 and 27, west of the Principal meridian. This kept us busy till November 6, when we began working north again along the railway. We brought our work to a close in the vicinity of tp. 62-18-Pr. in the early part of March and returned to Pas, where the party was disbanded.

The country surveyed along the Hudson Bay railway between ranges 14 and 19 is mostly level, or very gently rolling. It is generally of a swampy nature, and one might well describe it as a succession of spruce and tamarack swamps, alternating with ridges of limestone on which there is always a growth of jackpine with some poplar.

In several places we dug to a depth of about six feet to get drinking water, and it was usually found that at a depth of about two feet there was a very good clay soil. On top of this clay there is a thick growth of moss which holds the water like a sponge, and which would have to be removed before anything could be done in the way of farming operations. It could be cut, dried and stacked and would make peat of good quality, and if this were done the clay loam left would, if properly drained, form a first-class soil suitable for mixed farming and grain growing. In range 14, I noticed one or two ditches put in by the railway constructors from the track to Mitishtio river, and the effect was very noticeable, this being one of the driest parts of the district surveyed, yet I was told that this had been one of the worst swamps that the railway had to cross.

There are a few spots where the clay comes close to the surface, and on one of these I found a trapper with a small garden in which he was successfully raising potatoes, carrots, turnips, cabbage, lettuce and radishes, and there appears to be no reason why the same could not be done elsewhere, if proper drainage were provided.

I also saw oats and barley growing along the track, the seed evidently having been dropped from cars in transit.

Though swampy, none of the land is liable to flood through the overflowing of rivers. There is no hay in this part of the district.

The timber consists of spruce, tamarack, jackpine and poplar, and seldom exceeds a foot in diameter. The reason of this is that the moss in the swamps is not strong enough to hold large trees in a high wind, and on the limestone there is not usually sufficient soil to give large roots a firm hold. There is plenty of small timber in the country; in fact there is no open country in the usual sense of the term.



Mitishto river is the only stream of any size in this district; it is a little over a chain wide and about three feet deep, but the current is very slow, seldom exceeding a mile an hour. It lies in a slight depression which can hardly be called a valley, and in only one place, on the east boundary of tp. 64-14-Pr., were the banks steep. Elsewhere the slope is so gradual as to be unnoticeable. It flows from the east end of Limestone lake, crosses the track close to the lake and is never far from the railway as far as our survey went. Many of the swamps along the railway could be drained into it. No water-power could be developed.

No coal or lignite was found, nor was there any mineral of economic value seen within the limits of the survey. The new gold field, at Herb lake, is not very far away, however, and is reached by a sleigh trail, cut after the survey was made, which leaves from the siding at Woody lake in tp. 64-15-Pr. about eighty miles from Pas. Prospectors state that the claims are very good, and that the district will develop into a good mining camp.

There is no stone suitable for building, but limestone is everywhere plentiful. It is probable that a considerable part of this could be used in the manufacture of lime.

Summer frosts occur, but these would not be sufficient to hinder any farming operations which might take place.

Two large lakes were seen in this part of our work, Woody lake in tp. 64-15-Pr., and Limestone lake in tp. 62-18-Pr. The former is from twelve to fifteen miles long and six miles wide; it lies in a southwesterly direction, the northeasterly extremity being in tp. 64-15-Pr. Its shores, as far as we saw them, are sandy or rocky. It empties into Woody river, which is twenty feet wide and six feet deep, and has a current of about six miles per hour. I was informed that it runs in an easterly direction and then southerly flowing into Pine river. Limestone lake lies wholly in tp. 62-18-Pr.; it is five and a half miles long and half a mile wide. A trail runs from the southwest corner of this lake to Moose lake, about eight miles distant in a southerly direction, but as fires have caused a large part of it to be filled with deadfall, it is not at present suitable for use. Both Limestone and Woody lakes are deep and the water in them is good and clear.

There is a spring of excellent water at mile 78 on the Hudson Bay railway in tp. 63-16-Pr., close to the track. We found it running in March, and it is apparently open all winter. It is by far the best water we obtained in this district.

Game is scarce, and with the exception of a moose, some caribou, and a few partridges, we saw nothing. Fish can be obtained in Woody and Limestone lakes, but both have been pretty well fished out, and it will take some time for a fresh supply to accumulate. Jackfish, whitefish, lake trout and sucker are the chief varieties obtainable. Several men were at work fishing in Moose lake last winter, and they stated that the supply was good. When a lake shows signs of depletion the fisheries inspector either refuses to permit fishing in that lake or limits the catch to a certain amount. This method should preserve the supply indefinitely.

In township 56, range 27 lie parts of Saskeram and Reader lakes. Both of these lakes are very shallow and have muddy bottoms. Three rivers, Saskatchewan, Carrot and Birch, run through the township, all three being navigable rivers while the last mentioned drains Saskeram lake. The east boundary of the township is only three miles from Pas.

Between the Saskatchewan and the Carrot there are numerous hay meadows and some swamps. The hay, a blue-joint of fine quality, is growing on a deposit of clay brought down by the rivers and left during the periods of flood. A conservative estimate of the amount of hay which can be cut in this township alone would be in the neighbourhood of four thousand tons, and this could be increased by draining some of the swamps.



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The meadow extends beyond this township into the adjacent ones, between Saskeram lake and Saskatchewan and Carrot rivers, and it would provide an immense amount of hay and make a good place for ranching. The only objection to putting it to such a purpose is the liability of the whole of it to flood. As I understand it, this is not likely to occur at high water in July, but just after the break up in the spring, and it is caused by the ice jamming in the Saskatchewan at Grand Rapids some distance below Pas.

As the soil is first class, it makes it a very desirable locality for mixed farming and grain growing. The former is badly needed in this vicinity, as Pas with a population of fifteen hundred is using condensed milk almost entirely and vegetables are at excessive prices.

I found seven settlers who had gone in along the banks of Carrot river to homestead, and four of them told me they had cut six hundred tons of hay from their four fractional quarter sections, and they had not by any means stripped the quarters of what hay was on them. These men know of the liability to flood, but they believe that it will not happen again, as the volume of water in the river seems to be lessening each year. In the fall ducks are very plentiful in Saskeram lake and the neighbouring marshes, and there are some geese to be had also.



## APPENDIX No. 33.

## ABSTRACT OF THE REPORT OF JAMES GIBBON, D.L.S.

## SURVEYS IN THE YALE DISTRICT OF THE RAILWAY BELT, BRITISH COLUMBIA.

Survey operations of the past season were commenced on May 6, 1914, in tp. 5-26-6, in the valley of Coquihalla river. I followed this river as far as the northern part of township 23 in range 7, subdividing all suitable lands. An independent and continuous traverse was also run along both banks of the river from its intersection with the east boundary of sec. 7, tp. 5-25-6, to its intersection with the outline between ranges 24 and 25 in township 6. From this latter point a single traverse line was run for both banks, to the intersection of the east boundary of sec. 33, tp. 7-23-6. These traverses made an independent check on all section corners and lines established.

My surveys in the Coquihalla valley had reached within a couple of miles of the steel on the new Kettle Valley railway, and as the back trail was both dangerous and difficult on account of canyons and heavy blasting on railway construction, I got transportation over this railway to Merritt, and thence to Hope by Canadian Pacific railway. I commenced the surveys required in township 5, range 26, on October 21.

On completing this survey, I closed field operations for the season, and on October 31 paid off my party. The lower parts of Coquihalla valley can be conveniently reached from Hope by wagon and pack-trail. The upper reaches can be more easily reached by the Kettle Valley railway construction train from Merritt.

The greater part of Coquihalla valley is heavily timbered with large fir, cedar and hemlock, reaching well up on the mountain slopes, with dense undergrowth in the lower elevations. This meant heavy continuous axe-work all season in the projection of our lines. The valley is comparatively narrow with precipitous mountain sides of about 4,000 feet elevation.

Anderson, Pierre and Dewdney creeks are tributaries from the east. Their valleys are narrow and confined with steep slopes starting from the water's edge and leaving no bottom or agricultural lands. There is considerable fir and cedar in these valleys, but it will be difficult to get out, owing to the rough nature of the creeks and the confined valleys. Timber berth location No. 458 is on Dewdney creek two or three miles from its mouth.

Ladner creek comes in from the west, joining Coquihalla river in sec. 24, tp. 6-25-6. There is considerable fir and cedar timber throughout its valley and on the adjacent mountain slopes, and also on the south side of the creek, extending back from Coquihalla river some two or three miles. This is a more promising section for timber than the other tributaries, but part of timber berth No. 177 extends into this region of timber and of course occupies the most accessible portions. This valley presents no agricultural possibilities.

These creeks are from seventy-five to one hundred links wide and from two to three feet deep under ordinary conditions, and have a current of six to eight miles per hour.

From Ladner creek up through ranges 24 and 23, the river narrows to about one chain in width, and decreases correspondingly in volume. On reaching township 7, range 23, there is a sudden rise of some fifty feet, and the river bottom widens out into a natural dam location. Some water-power could be developed at this point, but the supply of water would be rather uncertain, owing to the elevation and the nearness



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to summit, causing the supply to come nearly all from flood conditions. It might, however, be practicable to use it as a means of converting the timber above it into lumber.

There are some indications of minerals in the lower stretches of the valley. Several miners were operating in a small way all summer, prospecting and washing out placer gold from the gravel bars of the river. They reported better than wages as the result. Some rich prospects in gold-bearing quartz are reported as being found and opened up on the western slope in township 6, range 25; as high as nine hundred dollars to the ton is reported. Staking of claims has been active all along the hill-sides.

Very little game was seen other than a few mountain goat and indications of black bears and deer. The river contains numerous small trout, but is kept pretty well fished out by the large number of men working on railroad construction.

No doubt in the near future when the new railway is in operation throughout the valley, the natural resources in timber and minerals will be developed, and the favourable spots for cultivation will be taken up. There is a splendid opportunity for the erection of a portable mill or mills at favourable points for manufacturing and shipping lumber, ties and wood, and thus utilizing and conserving much valuable timber that usually goes to waste in general lumber operations.

The season was very favourable for field operations, with very little rain, no excessive heat and few flies.



## APPENDIX No. 34.

## ABSTRACT OF THE REPORT OF T. D. GREEN, D.L.S.

## SUBDIVISION IN SOUTHWESTERN ALBERTA.

My work during the past season consisted of subdivision surveys west of Red Deer in tps. 35 and 36-8-5 and tp. 40-10-5.

We outfitted at Rocky Mountain House and left for tp. 35-8-5, reaching there on June 12, 1915.

Two routes lead from Rocky Mountain House, the nearest railway station to our work. The first and old route crosses the upper bridge over Clearwater river, passing Dovercourt post-office and thence to Ricinus in tp. 36-7-5. Up to this latter point the country is well settled and the roads are generally in fair condition, but beyond that the wagon roads are newly cut out by survey parties, and after reaching range 8, practically make a circuit around the central portions of townships 35 and 36. An old pack-trail follows the northwesterly or left bank of the Clearwater through these townships, and continues up stream probably to the source and beyond, to join the pack-trail from Laggan to the Kootenay plains. There are several different branches running north towards the Saskatchewan. One of these, which forms the second route to the district, leaves the pack-trail in range 9, and goes northerly to Swan lake, thence northeasterly along Swan creek, passing through the northwesterly portion of tp. 36-8-5. The Forestry Branch has recently improved this trail to such an extent that wagons can now travel thereon from Prairie creek to the Clearwater. It joins the Prairie creek-Rocky Mountain House trail near the mouth of Swan creek. The latter is a wagon trail leading to Rocky Mountain House by either the upper or lower bridges over the Clearwater. The route by the upper bridge is much better though longer.

Township 40, range 10, can now be reached by railway, as Horburg a station on the Brazeau branch of the Canadian Northern railway is situated in section 6, tp. 40-9-5. In addition to this the Northern Construction company's "tote" road from Rocky Mountain House leads to the southern part of the township and a branch therefrom leads through the northeastern part along the south branch of Baptiste river.

In these upper reaches of Clearwater, Saskatchewan and Baptiste rivers moose and deer are quite plentiful, and rabbits are so numerous as to be a nuisance. Fish also are very plentiful. Ordinarily there is not enough snow for sleighing before the latter part of December, but last fall there was sufficient snowfall early in November for permanent sleighing. The ordinary depth of snow in the winter is about fifteen inches.

Owing to the high altitude and the existence of large muskegs and marshes summer frosts are prevalent in the district.

The river valleys are excellent for cattle ranching.



## APPENDIX No. 35.

## ABSTRACT OF THE REPORT OF A. H. HAWKINS, D.L.S.

## MERIDIAN AND BASE LINE SURVEY IN NORTHERN MANITOBA.

On March 5, 1914, I left Pas, the place of organization and proceeded to Thicket portage, travelling ninety miles by Hudson Bay railway and thence by freight teams for one hundred miles along the right of way.

Our first work of the season was the survey of the Principal meridian through townships 81 to 88. Owing to the late spring it was possible to place a considerable amount of supplies on the north boundary of township 82, about twelve miles beyond the starting point of our survey. From Thicket portage the outfit was moved by dogs teams along a fairly good sleigh road, to Partridge Crop lake, but from there north to Odei river in township 82 progress was slow, on account of soft weather, deep snow and lack of trails. From Odei river man-packing was resorted to for a distance of about twelve miles, to the northeast corner of township 83.

The rivers broke up about May 10 and as all our canoes were at Thicket portage in township 73, we had to construct rafts to cross Odei and Meridian rivers. The men with the canoes arrived on June 10, having travelled via Wintering and Partridge Crop lakes, Grass river, Split lake and Burntwood, Odei and Meridian rivers. Later we found a much shorter route on the west side of the meridian from Thicket portage to Burntwood river, and thence down that river. Meridian river which had apparently never been used as a canoe route was full of log jams. We cleared these out, and now a waterway extends from Thicket portage to township 86. No farther waterway exists, as this appears to be the divide between the Churchill and the Nelson.

Odei river which is about two chains wide and from six to sixteen feet deep, with a current of two to three miles per hour, crosses the Principal meridian in township 82. A half mile farther east it is joined by Meridian river which crosses the meridian once in township 85, once in township 84 and three times in township 83. The source of Meridian river is Big Fish lake in township 86. From this lake short portages can be made to navigable waters flowing north into Churchill river.

The country crossed by the line is all clay formation, and judging from the banks of the streams the clay is of considerable depth. A granite ledge on the summit of a ridge in township 84 was the only rock seen south of Big Fish lake. The clay belt apparently extends from Burntwood river to township 89. The surface in the southern part of this belt is gently rolling, and muskegs, sloughs and floating bogs are numerous. The surface soil in the depressions is peat with clay subsoil, while on the higher lands the clay appears on the surface. Forest fires are prevalent, as during the summer the dry moss burns like tinder.

The northern part of the clay belt is gently rolling and covered with spruce and tamarack up to ten inches, with some poplar and birch up to six inches. A few large spruce grow alongside the rivers, but the timber generally is suitable only for pulp.

Swamps, marshes and muskegs abound throughout the whole region, and thorough drainage is necessary before settlement could be attempted. The many streams would render drainage comparatively easy, and danger from early and late frosts would no doubt be greatly lessened.



No grass grows in the district, but gardening at Norway House and Split lake has been carried on with considerable success.

The district is easily reached by water from many points on the Hudson Bay railway, but the waterways are difficult to follow.

Water-power could be developed on Grass, Nelson and Burntwood rivers. A fall of about twenty feet was also seen on Meridian river in township 82, the portage around it being about five chains.

No coal, lignite nor minerals were noticed in this district.

A few foxes, wolves, bears, mink, otter and martin were seen, and moose appeared to be plentiful. Beaten paths indicated that the barren lands caribou had wintered there, but they had gone north before our arrival.

Frost occurs every month of the year except perhaps July. At the beginning of May, 1914, there was two feet of snow which did not entirely disappear before the middle of June, and frosty nights began on August 20.

Levels were taken on the line to township 88, and magnetic observations were made at frequent intervals. Some azimuth observations and one observation for latitude, consisting of seventy pairs of stars, were destroyed by a camp fire on July 1. This fire also destroyed some of our supplies, so that after surveying the 22nd base line one range east and west of the meridian, we returned to Pas reaching there on September 19.

I then organized a party for the retracement of the Second meridian from the 15th base as far north as township 85, and of the 15th base westerly from the meridian to range 22.

We left Pas on October 10 and on the 26th began work on the meridian at Namew lake. This place was selected as a starting point, as the line farther south was reported to be very wet.

Moving camp had to be done by canoes and man-packing, the dog trains being left at Namew lake till cold weather would set in. Comparatively mild weather prevailed until the middle of November so that the dog trains did not arrive until the 20th.

Directly north from Namew lake dry, rocky country, well timbered with black spruce, tamarack and jackpine, extends about six miles north and three miles on each side of the meridian, but farther north the country is mostly muskeg.

The wagon road follows the east side of the meridian to within a half mile of Sturgeon-weir river where it crosses the meridian and leads to a place called Beaver City, on the south shore of Amisk lake. If the mining locations around this district prove valuable this centre will be of some importance, as great opportunities exist for the development of water-power, and fish and game can be had in abundance.

In the north part of township 62 there is an extensive spruce muskeg with a hard bottom about fourteen inches below the surface. Timber, which grows larger toward the north, is found on small ridges throughout the muskeg.

The limestone formation which was in evidence all along the line from Namew lake disappears in township 64 and a granite formation begins. Mineral indications are found along this line of contact.

On November 20 the dog trains reached camp and the lakes being frozen sufficiently for travel they were used for moving camp and taking in supplies. The seven trains proved inadequate as we had to move camp every second day.

In township 68 the line crosses the first of the chain of large lakes which form an almost continuous waterway to township 85. Whitefish, jackfish, pickerel and sucker appeared to be plentiful in these waters and form the chief diet of the Indians living there. Feed for the dogs consisted of fish caught in these lakes, and it was necessary to keep one man fishing and looking after the nets while we were in this locality.

The southern fringe of the herds of barren land caribou were seen in township 84, but the main herds were farther north as the winter was mild.



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The Second meridian was finished to township 85 on January 10, 1915, and the portion of the line south of Namew lake, which was too wet to retrace in October, was finished by the end of January. In this portion only township 58 is wholly on land. The main trail from Pas to Cumberland House passes the north end of Belanger lake in township 57. Much traffic passes over this trail in winter as all supplies from Pas for settlements west and north pass over it. Large quantities of fish shipped to Pas also go over this trail.

Steamers on Saskatchewan river can pass into Cumberland lake during high water, and from there through Whitey and English Narrows into Namew lake. Amisk lake is then reached by a short portage from Namew lake. Amisk lake is about thirty miles long and sixteen to twenty miles wide. Its shores are well wooded, and much work has been done developing mining claims along the west side. The fishing industry is also important, as during last winter considerably over one hundred tons of trout and whitefish were shipped from this lake. Churchill river, which crosses the line in township 79, appears to consist of a series of lakes stretching across the country. The shores are rocky and frequent rocky rapids render navigation dangerous.

Several lakes lie along the meridian north of township 85, the largest being Kamuchawi lake in township 83. This lake is about twelve miles wide and fifteen miles long.

Only a small amount of tillable land is found in this district, and it is all covered by forests. Garden vegetables grow at Cumberland House and I am told also at Amisk lake. Fishing and mining are likely to prove the most important industries.

The retracement of the 15th base west of the Second meridian was begun on February 1, 1915. This line follows along Saskatchewan river, crossing it three times in the first eight ranges. If the spring freshets on the Saskatchewan could be controlled and this land reclaimed from flooding, hay for many thousands of cattle and horses could be secured.

The valley of Torch river, which is first crossed in range 8, is well wooded with spruce, tamarack, poplar and cottonwood up to twenty inches. Some good farms are found in the valley, but the remainder of the country is one vast muskeg, with a few sandy jackpine ridges.

In range 17 the line crosses sand hills, some of which are bare on the tops, while the slopes are covered with spruce, tamarack, poplar and white birch. An old surveyed line of the Hudson Bay Pacific railway was crossed in range 18.

The line was completed across range 21 on March 10 and Cumberland House was reached on the 17th.

The mild winter and light snowfall made the trails bare very early in spring and travelling with sleds was difficult.

Very little merchantable timber was seen except along Torch and Saskatchewan rivers. No hay meadows or marshes were noticed farther north than Saskatchewan river, muskeg and sand ridges being the predominating features of that district.



## APPENDIX No. 36.

## ABSTRACT OF THE REPORT OF G. H. HERRIOT, D.L.S.

## BASE LINE SURVEYS IN NORTHERN MANITOBA.

The survey of portions of the 19th, 21st and 22nd base lines east of the Principal meridian, portions of the 23rd and 24th base lines east of the Second meridian east and the Second meridian east through townships 85 to 88 inclusive, together with certain township outlines, comprised my work of the past season.

From Selkirk we went north by boat to Norway House, thence by barge to Whisky Jack portage, across this portage and down Cross lake and Nelson river to Shoal falls. We portaged the outfit on the tramway to Sipiwesk lake and then went by canoe to Cross portage. After crossing this portage we followed Landing lake to where our season's work commenced on the 19th base at the Principal meridian.

On June 24, after retracing a couple of miles of the Principal meridian, we turned off an offset line to the east, at three chains south of and parallel to the 19th base line. This offset line was necessary because the intersection of the 19th base and the Principal meridian falls in Landing lake, and is witnessed by an iron bar and mound on the south shore four chains distant from the true corner.

The offset line was extended eastward across Landing lake a distance of a little more than eight and one-half miles, when the east mainland was reached. The azimuth of the offset line was carefully determined, and its length ascertained by laying off two base lines on the south shore of the lake, and from these base lines a double system of triangulation was extended down the lake to the point where the offset line struck the east shore. There a third base was opened and chained, to which the two systems of triangles were tied, in order to test the accuracy with which our triangulation had carried forward our standard of measurement. The test was very satisfactory. On reaching the first summit we opened a line north on which we established the position of the 19th base line, and after opening the line westward to the lake shore, we commenced its production eastward. It was continued without interruption until the NE. cor. tp. 72-5-E. was reached on July 29.

During the greater part of the work on this base line canoes were used for shifting camp, although three moves occurred involving back-packing, but even where the canoes were used quite a number of portages were necessary.

On July 29, the party returned to Nelson river, and the following day proceeded down the river and reached Split lake on August 1. On the 4th, we left Split lake with five Indians, bound for Landing river, and proceeded up Landing river to the fourth rapid, from where I sent three canoes with three Indians and three of my regular men back to Shell rapids to commence freighting down the Nelson. The remainder of the party pushed on to Surprise lake where we pitched camp about two miles east of the NE. cor. tp. 80-11-E. The following day, August 7, we began the production of the 21st base line, and it was continued eastward with all possible speed, until on October 13 the NE. cor. tp. 80-20-E. was reached. The country traversed is broken by innumerable lakes entailing many triangulations. Cyril lake and Fox lake owing to their size required very large triangles and much careful work. The transport over the first twelve miles of this base line was handled by canoes and only the portages necessitated back-packing. Then for a stretch back-packing was resorted to, until Cyril lake was reached, when canoes were again used



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until Fox lake was crossed. From the east shores of Fox lake back-packing was again necessary, the canoes being used only to take supplies down Fox river. Over this latter stretch of country a canoe had to be carried along the line, as many lakes were encountered during its production.

During this period of the survey the party was greatly handicapped for lack of regular packers. It had been necessary to leave one of my most reliable packers in charge of the Indians freighting from Shell rapids down the river to a cache they were placing just above Kettle rapids, and two others were busily engaged freighting from Shell rapids direct to camp. Moreover, as the waterways along Fox river route entail many long portages, these latter freighters and my camp transport were greatly delayed. The axemen and others of the party were therefore frequently required to assist the regular packers.

On August 21, I left camp to return to Winnipeg for my winter transport, and after a few days spent in hiring five more men to assist in taking the dogs down the river, I started north again. At Little Bull Head we picked up thirty-six dogs that had been purchased for me. Five more dogs were purchased below the lake and taken with the others down the river as far as Shell rapids. From this point the dogs were led along the right of way of the Hudson Bay railway to Landing river, where they were met by three canoes that had gone around by Nelson river, Split lake and Landing river. On October 8 we started up Landing river, and on the 17th reached Fox lake, where I left two men to fish for dog feed. On the 19th I proceeded down Fox river to try to reach camp with the winter outfit before freeze-up. After a trying journey we came up with the camp on the east outline of tp. 82-20-E.

On October 26, I sent a number of men back to Fox lake to bring in the dogs as soon as sufficient snow had fallen and the lake should be passable, for on the nights of October 24 and 25 some of the smaller lakes had frozen over. Two of the trains were to go to my cache near Kettle rapids after supplies, as we were running very low, and to rejoin the party after it would be moved up to the 22nd base line.

In the meantime we continued the east outline of range 20 north, and opened the theoretical jog to the east by November 2. Four dog teams had arrived the evening before, although the scanty amount of snow limited their loads very materially. The next day we commenced to move north to the 22nd base line, but owing to the soft snow that had fallen during the night, the dog trains could haul but very light loads. We were therefore compelled to back-pack the greater part of the outfit. Progress was very slow as it was necessary to double trip over the whole journey, for our outfit had been greatly increased by the addition of camp stoves and winter tents and clothing. It was not until November 6 that we at last pitched camp within two and one-half miles of the NE. cor. tp. 84-20-E.

The following day most of the party commenced work on the east outline of this township, while with three men and a dog train I started to open a trail west, to make a juncture with the trains bringing supplies from Kettle river cache. We made connections with these trains the next day, and returned to camp only just in time as the last of the flour was in the bake-pan, and we had been out of bacon and some other supplies for several days.

We completed the east outline as far as the 21st correction line on November 18, and then moved back to the 22nd base line, which we extended eastward to the Second meridian east, and by December 22 the meridian was surveyed north as far as the monument established by Mr. B. W. Waugh, D.L.S., to mark the intersection of the 23rd base line with the meridian.

Throughout this period the snowfall was comparatively light, and this, combined with the rough hummocky nature of the surface of the country, made the transport very hard on the dogs. Many of the dogs played out and not a few died on the long trips. As previously pointed out the summer freighting had been carried on under great difficulties, with the result that only actual camp necessities were brought down



to the Kettle river cache. No cornmeal nor tallow were carried, as I felt that fish could be caught for part of the season at least. Three men were left at Fox lake to fish. All the dog feed had therefore to be hauled over these rough trails, and as the distance from Fox lake was rapidly increased the work of transporting feed and supplies became more and more difficult.

On November 27, I left camp to return to Shell rapids, to make arrangements for winter freighting, and did not again reach camp until December 13. On the journey, I met the engineer in charge at Port Nelson, and from him received an order for cornmeal and tallow at the Government cache at Limestone rapids, which is located about sixty miles up the Nelson from Port Nelson. He also furnished me with a description of the location of the Government cache at this point, and one near Angling river, but even with this information at hand, it took me four days to locate and open a trail to Limestone cache from my camp.

Between December 22 and February 18, the 23rd base line was extended across the first eleven ranges east of the Second meridian east, without any delays, although on occasions the progress was generally retarded, owing to the inadequate transportation facilities. On February 19, the east outline of range 11 was turned off to the north, and produced across townships 89 and 90. The theoretical jog was completed to the east on February 25 and on the following day we moved north to the 24th base line, commencing its production eastward. This line was continued as far as Hayes river, where we endeavoured to extend it across the river, but owing to the overflow caused by the tides we were compelled to abandon this part of the work. We accordingly returned to the north shore of the river, where we turned off a line parallel to the east outline of range 11, and produced this line south across the river, computing the distance across by means of a double triangulation. From here we opened a line east to its intersection with the theoretical position of the east outline of township 92, range 11. Here the east outline was turned off and first opened north to Hayes river, and then run south to the jog at the correction line. Work was completed on March 11; and the following day we moved back to York Factory.

During the interval between Christmas and the conclusion of the survey, we fed the dogs on cornmeal and tallow, part of which was hauled from Limestone cache and part from Port Nelson. Although this feed was closer than the fish, it was far from satisfactory, as both the meal and tallow were of an inferior grade. I therefore endeavoured to use a few fish along with the meal, but very few fish could be taken in Fox lake and our attempt to fish in Angling lake proved a failure.

My transport, from Christmas until February 19, when my men reached camp with dogs secured from Mr. B. W. Waugh, D.L.S., consisted of seven trains. And it was only the fact that I had received permission to draw one month's supplies for twenty men from Limestone and Angling river caches that made it possible for this small transport to handle the work. Moreover, the line was advanced rapidly eastward, necessitating frequent moves, and the scarcity of firewood made it necessary to haul wood, thus augmenting the already heavy work for the dogs. Throughout January what trains I could spare from time to time made trips to Port Nelson after supplies, so as to be able to keep ahead of the actual needs of the camp.

The advance on the 23rd base line eastward steadily increased the distance from the tote road north of the river, so that each trip to Port Nelson necessitated the breaking of new and longer trails from camp. However, with the arrival of Mr. Waugh's dogs, my transport was easily able to handle the work, and it was possible to send two hired dog teams back to Split lake.

On March 13, we left York Factory on our return, arriving at the end of steel on the 24th, and at Pas the following night. The next day I paid the party off.

About 240 miles of base line and meridian outlines, and about one and one-half miles of jog on the correction lines, were opened during a period from June 24, 1914, to March 11, 1915.



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The country traversed by the survey may be described according to the different base lines. The 19th base line passes through the best country met with during the survey. The country west of Nelson river is much broken by Landing and Sabomin lakes, and numerous smaller lakes. In the immediate vicinity of the lakes the land is low and tends toward muskeg, but back from the water areas the surface rises gradually, forming land much more suitable for farming. The soil is usually a deep clay overlaid by a few inches of moss. Landing lake is a beautiful rock-bordered body of water probably thirty miles long and from one to one and one-half miles wide. The water is exceedingly clear and abounds with whitefish. Sabomin lake is only four or five miles long. The timber throughout this area is stunted, although fairly thick, and consists largely of spruce from three to six inches in diameter. A few larger spruce are to be found in a fringe about the lakes and on the islands. Nelson river is crossed by the 19th base line in sections 33 and 34 of range 4 east. It is here thirty-eight chains wide, with a very swift current. The western bank is quite precipitous and very rocky, while the eastern slope is very gradual. East of the river fewer lakes are met, and the surface, although almost level, is covered with very hummocky moss and is very much wetter in places. A large portion of this section is covered with small fire-killed spruce, and the surface soil has been seriously damaged by repeated fires.

The 21st base line passes through nearly level country in range 12 east, with the result that it is mostly one continuous muskeg, covered with small stunted spruce and tamarack. It is broken by Surprise and War lakes, the latter of which abounds with whitefish. In the eastern part of the range, burnt country is met and much standing, fire-killed spruce appears. The luxuriant growth of wild berries testifies that the surface soil has not been injured by the recent fires. This portion of the country is very suitable for agriculture, with a deep clay soil covered by a very shallow layer of moss. Farther to the east many small lakes are met but only those connected with Fox river have any whitefish. Cyril river traverses ranges 13, 14 and 15 just a short way south of the base line. This river is only about fifty or sixty links wide, and at low water is not very suitable for large canoes. In low water the river above Cyril lake has many rapids necessitating frequent portages some of which are almost one-half mile long.

Cyril lake is crossed by the line in range 15. It is about four to five miles long and one and one-half miles wide. Just to the north of it, a high jackpine ridge occurs to break the otherwise regular surface, while still farther to the north extensive swamps appear. The country between Cyril and Fox lakes is nearly level, broken here and there by small lakes. The surface is low and swampy, and although drainage is possible, and clay is to be found below the muck, the land will be of little value for many years. Small spruce and tamarack give place occasionally to fire-killed timber.

Fox lake is crossed in ranges 17 and 18 east. This is a fine body of water with an irregular shore line. It is seven or eight miles long and from two to three miles wide. Whitefish, jackfish, pickerel and sucker abound in its waters, but owing to the many shallow bays it is difficult to locate them in mid-winter. Fox lake discharges its surplus waters through Fox river, which is several chains wide near the lake, but after following a sluggish meandering course for two or three miles it narrows down to a stream about two chains wide, with exceedingly swift water. During the fall of the year when the water is low, it is a very bad river for canoe work, as its bed is full of boulders, and the current is so swift that one is either stranded upon a boulder, or else by it before it can be seen. The whitefish are easily taken about the end of September by damming this stream at a rapid, and catching the fish in a willow basket.

The country lying east of Fox lake is broken by many small lakes. The surface is somewhat irregular, owing to the occurrence of low ridges, which are generally covered with small jackpine. Elsewhere small spruce and tamarack appear. The soil is



a clay overlaid with varying depths of moss and black muck. Small areas are very suitable for farming, but the largest part of the country requires draining.

Range 20 is traversed by Thick Bush creek as it flows south into Fox river. Along its banks is to be found a fringe of good spruce, some trees reaching a diameter of twenty-eight inches.

The country traversed by the east outline of range 20, through townships 81 and 84 inclusive, is generally very wet and swampy. A jackpine ridge breaks the swamp in township 82, while township 81 is broken by three marsh-bordered lakes. This section is very undesirable, while townships 83 and 84 are in parts so wet as to be almost impassable in summer.

The 22nd base line across ranges 21 and 22 east runs through better country. It is broken by tributaries of Angling river, which probably accounts for the drier surface.

The Second meridian east across townships 85, 86, 87 and 88 traverses considerable swampy country. To the east of the meridian Angling lake breaks the otherwise regular surface. This lake lies in a northeasterly and southwesterly direction, and is about eight miles long by one-half mile wide. Whitefish, jackfish, trout and sturgeon are to be found in its waters, although efforts to catch them in midwinter were unavailing. Considerable burnt country adjoins this line; and the frequent fires have materially impaired the soil. Clay underlies the moss and black muck in all sections. In section 14, township 87, Nelson river is crossed. It is here fifty-one chains wide with a very swift current, as testified by the manner in which the ice was piled up five to eight feet at this crossing. It required the work of three men nearly a whole day to cut a dog trail across the river on account of the rough ice. The clay banks are between eighty and one hundred feet high.

The location line of the Hudson's Bay railway is crossed in section 2, township 88. The country north of the Nelson adjoining the railway is nearly level. Frequent beaver dams occur, thus creating flooded areas. The timber is fire-killed in places, with the remaining areas covered with stunted spruce and tamarack. The otherwise regular surface is broken by slight rises, forming islands of drier land covered with a denser growth of spruce.

The 23rd base line east of the Second meridian east, traverses country very similar to the above. In section 32, township 88, range 2, Nelson river is again crossed. The approach from the west parallels a small creek and is therefore gradual, while on the east side the line leaves the river by ascending a very steep bank. The banks along here are from eighty to one hundred and twenty feet high with frequent steep clay cut banks. A narrow fringe of fair timber is found at intervals in the valley, with some rather good pulp timber in other places.

The country east of the Nelson, is comparatively dry until after Angling river is crossed in section 32, range 3, but small spruce and tamarack is still the prevalent growth. A great many small lakes break the regularity of the surface. These lakes are generally connected by small creeks so narrow as to be useless for canoe transport. The soil is clay overlaid with several inches of moss. Occasional open swamps adjoin the lakes. Angling river is a winding stream two chains wide, flowing in a valley about fifty feet deep. The fall over a length of about thirty miles between Angling lake and Nelson river, is approximately 200 feet, with the result that the current is very swift, necessitating almost continuous tracking when going up-stream. East of Angling river the country is nearly level, and large swamps are more frequent, many of which are connected by small creeks. The soil is largely a moss-covered black muck, eighteen to twenty inches deep, overlying a yellow clay. In many of the pits, water appeared before the depth of eighteen inches was reached. Stunted spruce and tamarack appear everywhere except on the open swamps. Occasional belts of brule were crossed where the surface has been dry enough to allow the fires to run. Owing to the depth of snow



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over these areas it was difficult to ascertain how badly the surface soil has been damaged by the frequent fires.

In section 36, range 8, the line crosses Penny-Cuttaway river. This stream which is six chains wide, follows a very winding course in the bottom of a narrow valley about seventy-five feet deep. A fringe of fair timber, mostly spruce, is found in the valley. This river rises near where Fox river empties into the Hayes, and after a most meandering course, roughly parallel to the Hayes, it discharges its waters into this river about three miles north of the base line. It is very difficult to determine just where the height of land between Nelson and Hayes river watersheds crosses the line.

Hayes river is crossed in section 32, range 9. Occasionally the steep banks recede in gradual slopes from the bed of the river, but elsewhere a forty-foot bank rises on either side. Clay cut banks occur at intervals, and innumerable springs break through the foot of the slopes, making the edge of the river bed almost a continuous sloping ice sheet in winter. Some fair spruce suitable for building purposes grows in the valley. The Indians from York Factory have for many years cut their timber up this river and its tributaries, and after rafting it down to York, have whip-sawed it for building purposes. The current of the Hayes is very swift as testified by the rough ice. In fact a great deal of tracking is necessary when going up-stream. A few small rapids occur between York Factory and the mouth of Shamattawa river, but none that would prevent the rafting or driving of sawlogs.

The country east of Hayes river adjoining the 23rd base line is very undesirable, consisting chiefly of extensive swamps, broken by small islands of higher ground. These swamps extend eastward beyond range 11 east, and south probably ten miles, and to the north almost to Hayes river. It was plainly evident that this district would be practically impassable in summer. Stunted spruce and tamarack grow where the open swamps give place to bush land.

The country traversed by the east outline of range 11 is very similar to that traversed by the last two or three ranges of the base line. Hayes river is crossed in section 25, township 92, and being within about three miles of its outlet it is about two miles wide at this point. The tide waters from Hudson Bay affect the water level of the river for a distance of about twelve miles up the river. In usual tides the change in level is about eight feet, while in spring tides the water rises fifteen feet above ordinary level.

The 24th base line across range 11 east runs along the long point between Nelson and Hayes rivers. The land is very level and is largely one extensive tamarack and willow swamp. Hayes river is reached in section 35 of this range. York Factory lies partly in sections 21, 22, 27 and 28 of township 92, range 11. It is quite a large Hudson's Bay post, comprising in the reserve about 177 acres. It was surveyed in 1901. Several very large buildings give the post quite an imposing bearing. These extensive structures speak in no uncertain manner of the amount of supplies that once entered the interior of western Canada by way of this natural gateway. For years before the railway reached Winnipeg, supplies were brought across from England in the Hudson's Bay company's boats and landed in York Factory. These supplies were handled in York boats by way of Hayes and Nelson rivers. Many tons of supplies were taken up Hayes river to the Nelson and thence up the Nelson to Warren's landing. From this point many tons were taken across lake Winnipeg to old Fort Garry, while other supplies were taken across to Grand Rapids and hauled across the long portage and started on the journey up the Saskatchewan, to such posts as Pas, Prince Albert, Fort Saskatchewan, etc. York Factory was thus a flourishing post before Winnipeg was even dreamed of. However, with the advent of the railway through the west, York Factory lost its prominence and many of the Indian families whose men depended on the summer transportation for employment, moved farther inland to the interior posts at Split lake, Cross lake, Nelson House, Oxford House and Norway House, where hunting and trapping were more plentiful.



Port Nelson is situated about one mile north of the 24th base line in range 9 east of the Second meridian east, on the north bank of the Nelson within only a few miles of the mouth of the river. Port Nelson is to be the terminal of the Hudson Bay railway. Work was in progress on the construction of harbour facilities, about 500 men being employed.

The only residents of this country are at present located at the several Hudson's Bay company's posts and at Port Nelson. The Hudson's Bay company's posts at Norway House, Cross Lake, Split Lake and York Factory are comprised mostly of the Indians gathered about the posts. Split Lake post is situated on the north-shore of Split lake, and about twenty-five miles north of the 21st base line, roughly in range 9 east of the Principal meridian. The Indian population probably numbers about 300. At Port Nelson there is a large transient population, but only a few permanent residents.

The climate throughout the district is sufficiently uniform to consider it as a whole. Throughout the summer the days are very warm, and the nights are quite cool. The daylight, however, is exceedingly long with the nights correspondingly short. Summer frosts occurred in May and June and again in August and September.

The winter extending as it does from the latter part of October until well on into April, is rather severe. Last year was regarded as the most unusual year, the amount of both the rainfall and snowfall was below the average, while the temperature throughout the winter was much higher than the general average. In the winter of 1913 and 1914 the meteorological reports at Port Nelson give an average of possibly 30 degrees below zero for the months of January, February and March, while during last winter the average for the same period would be less than 20 below, the severest record at camp was 54 degrees below zero. Port Nelson recorded 59 degrees below zero that same night.

The summer weather indicates that the climate is not very suitable except for the most hardy growth, although lettuce, radishes, potatoes, onions, turnips and cabbage have been grown at Split Lake post. Potatoes of small size, and a few other hardy vegetables have been grown at York Factory on a clay soil that has been hauled from the river banks to replace the moss and black muck on the surface.

The resources of the country, covered by the season's survey consist largely in water-powers and fur-bearing animals. Almost all kinds of fur-bearing animals found in Northern Canada are to be found here. Beaver, mink, marten, muskrat, otter, weasel, wolves, and foxes, including red, cross, silver, and white, are to be found in the district. The white foxes, however, are found largely along the coast, while the others keep more to the interior. The Indians generally make a rich fur catch each winter.

A few moose and caribou are to be found in the district. The barren land caribou or husky deer usually migrate south early in the winter, crossing the Nelson at Split lake and Gull Lake. Few ducks and geese frequent these lakes in summer and even the partridges and the ptarmigan are not plentiful.

As already stated, numerous rapids are met on all the rivers and streams. During the summer of 1914 and the winter of 1914 and 1915 the Manitoba Hydrographic Survey had a party metering and cross-sectioning Nelson river about four miles above Shell rapids, but their figures will omit the additional discharge from such rivers as the Armstrong, Landing, Grass, Burntwood, Ripple, Butnau, Kettle, Limestone, Angling and Kisemaguskun. Again, each one of these tributaries of the Nelson has numerous falls, which, if dammed, would produce considerable horse-power. No estimate has been made of the discharge of these rivers so that it is impossible to give even a rough approximation of the possible power development.

Fox river, as previously stated, has many rapids, and although the discharge is small, the fall over these is very considerable and much power might be developed.





Photo by J. R. AKINS, D.L.S.

#### LAUNCHING SCOW AT PEACE RIVER CROSSING.

For transportation on Peace river, scows are built, during the winter, on the shore just beyond high-water mark, and they are hauled down to the river when the ice moves out in the spring. They have a carrying capacity of twelve ton, and require the united efforts of fifty men to drag them along the skids to the water.

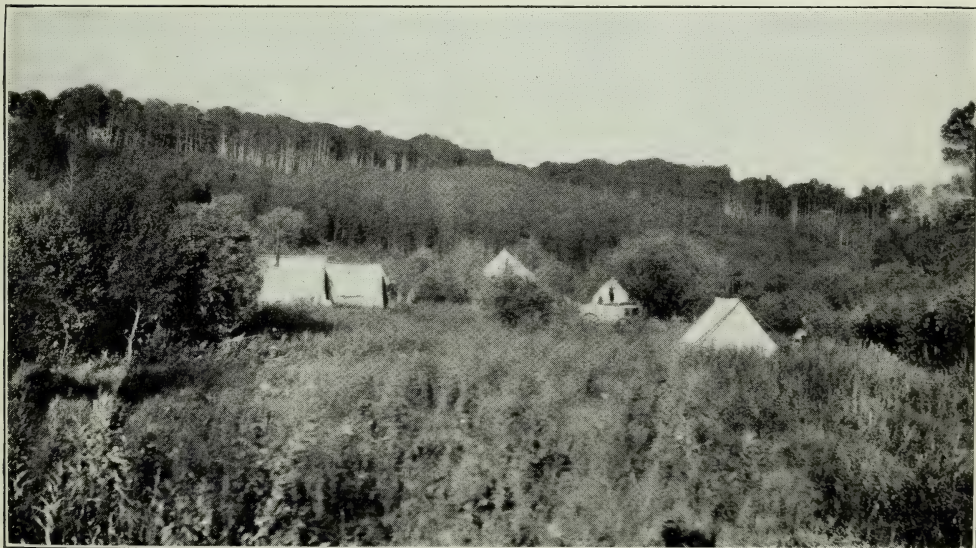


Photo by J. R. AKINS, D.L.S.

#### CAMP ON MEANDER CREEK—PEACE RIVER DISTRICT.

This view illustrates the open country found along the Hay River trail. Meander creek crosses the base line in tp. 112-20-5 and empties into Hay river farther north. Cherries and saskatoon berries grow in great profusion. The same kind of country extends almost all the way from Vermilion to the Hay River post, a distance of 100 miles. At places, the open country is several miles wide.







## SESSIONAL PAPER No. 25b

Hayes river too has frequent rapids, but with a much larger discharge. Its available horse-power would therefore greatly increase the estimate for this northern country.

Very little can be expected in the line of merchantable timber. The construction of the Hudson Bay railway will require much tie timber, and a great many piles, but the greater part of these will have to be brought in by rail. Port Nelson too will require an enormous amount of pile and crib timber, and this also will have to be brought in, although the railway company has been attempting to take out some logs along the Kisemaguskun river.

In the western part of the territory covered by the survey, rock outcroppings occur at frequent intervals. The shore-line of the larger bodies of water such as Sipiwesk, Landing and Split lakes is largely solid rock. Rock outcrops along the Nelson as far down the river as the last limestone rapids. Below this point the banks are clay. This entire absence of rock throughout the district for sixty miles surrounding Port Nelson, is going to be a serious handicap in the construction of harbour facilities. A belt of Huronian rock carrying narrow quartz veins outcrops on some of the islands in Split lake; but whether larger veins carrying mineral values will be found later can be determined only by careful prospecting.

Brief mention might be made of the abundance of fish to be found in portions of the country traversed. Landing, Split, Butnau, Moosenose, and Fox lakes abound in beautiful whitefish, while in Kettle, Sipiwesk and Angling lakes they are to be found in smaller numbers. Sturgeon can be caught in Sipiwesk and Angling lakes and in Nelson river, and trout below Kettle rapids. In the fall, before the ice starts to form, immense schools of a kind of herring come up the mouths of Nelson and Hayes rivers. No attempt has been made to catch these at Port Nelson, but many of them are put up for winter dog feed at York Factory. During certain periods in the summer numerous white whales enter the mouth of the Nelson going up with the tide and down with the ebb.

Since the spring of 1914 the means of entrance to this district has completely changed. With the extension of the Hudson Bay railway to Manitou rapids practically all travel into this district will be by rail. On March 27, 1915 the steel was laid about 220 miles beyond Pas, and should reach Manitou by June. The bridge across the Nelson at this point will probably require the remainder of the summer to complete. Therefore travel to Port Nelson will still follow the river from Manitou rapids. The current from there on is very swift with very frequent dangerous rapids to pass, so that none but experienced canoemen should undertake the trip. The trip up-stream from Port Nelson is very arduous, and considerable tracking is necessary.



## APPENDIX No. 37.

## ABSTRACT OF THE REPORT OF H. S. HOLCROFT, D.L.S.

## SURVEYS AT FORT CHURCHILL.

To reach Fort Churchill we travelled from Pas by construction train on the Hudson Bay railway to the end of steel, a distance of about eighty-five miles. From there we travelled with two hired teams and five dog teams to the end of the tote road, about 155 miles farther; at this point the teams turned back and we proceeded with dog teams along the right of way. When this could be no longer followed we struck across country toward Port Nelson. The country became rougher and more hilly, and our progress which was from ten to thirty miles daily, depended principally on the depth of the snow. Sometimes we were forced to lay up on account of wind-storms, as the temperature was considerably below zero and the snow was deep. Even with these precautions every one was badly frost-bitten on the trip. Close to Port Nelson the woods became lighter and we had some difficulty in getting dry wood for night camps. We rested the dogs at Port Nelson for a few days and resumed our journey on April 5. As we had a good Cree guide we took a direct line to Fort Churchill, not following the coast, as is usually done. At first the snow was deep and no trail was open, so we made poor time, but on the following day we began to strike the open places in the barren lands, and as the snow there was beaten hard by the constant northwest winds, travelling improved.

We passed over a considerable area of barren lands during the trip to Fort Churchill, and as the wind was frequently blowing we were delayed four days, during which time we had to remain in our tents. Fortunately the guides knew the country and camped at places where we could get a little shelter and lots of dry fire-wood. We arrived at Fort Churchill on April 13.

It was not yet possible to start the survey, so we stayed with the Mounted Police on the west peninsula and employed our time in getting firewood for my intended summer camp across the harbour on the east peninsula.

On May 28, I started to survey the townsite on the east peninsula, but I could do very little work, as the weather was very stormy and the snow too deep. It was not until after the first week in June that we could work regularly, and all during the summer there were frequently stormy days on which we could not work at all. The wind blew almost continuously and we had considerable rain. We had a snow-storm on June 10, and on the 12th there was so much snow that we had to wear snow-glasses.

After having completed the survey on the east peninsula, I moved across the river by canoe and again stayed at the Mounted Police barracks. From there I laid out the property for a police reserve and resurveyed the Hudson's Bay company's claim, about four miles south of the police barracks.

The Hudson's Bay company's supply boat arrived on August 20 and as I had completed the necessary work, I decided to go on it to York Factory, and at Port Nelson get an outgoing steamship to North Sydney, Cape Breton.

I accordingly sold my dogs and outfit to the Hudson's Bay company at Fort Churchill, and left by boat for York Factory on August 25, arriving there the following evening.

On September 3, the Royal Northwest Mounted Police whaleboat took us to Port Nelson, about twenty-five miles around by the sea, and on the following day we boarded the steamship *Sheba* and sailed about noon on the 5th.



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We arrived at North Sydney on the 14th and stayed there two days waiting for transportation and cash. I then paid off the party and gave them tickets to Winnipeg and proceeded to Ottawa myself.

The country around Fort Churchill is almost barren, though near Churchill river there is considerable spruce and some tamarack. The townsite on both peninsulas is barren, being either rock or rough country, mostly gravel. Grass grows in some places, principally around the edges of rivers and lakes.

We saw many small birds of different varieties, such as robins, song sparrows, etc., and large birds such as rooks, a few crows and owls. Geese and ducks of all northern varieties, snipe, plover and woodcock were also plentiful.

The summer is short in this district, beginning about July 28 and lasting only about six weeks. The spring is cold and wet, but the climate seems to be healthy.



## APPENDIX No. 38.

## ABSTRACT OF THE REPORT OF W. J. JOHNSTON, D.L.S.

## SURVEYS IN KAMLOOPS DISTRICT, BRITISH COLUMBIA.

The work on which I was engaged during the past season lay principally in the vicinity of Sicamous.

From Enderby we travelled east to tps. 18 and 19-6-6 where we ran some subdivision lines, traversed Hidden lake and surveyed three miles of the south limit of the railway belt. We then went to Mabel lake and subdivided parts of tps. 19 and 20-5-6. Mabel lake affords some excellent fishing and game was plentiful in the vicinity, twenty deer and a few bears being seen by our party.

Leaving Mabel lake on July 6 we moved to tp. 21-12-6. While in this vicinity we laid out a park site for the Chase Board of Trade, traversed part of Chase creek and subdivided parts of townships 21, ranges 12 and 13. This work was completed on July 27.

Chase creek runs through a canyon 1,500 feet deep on one side and 500 feet on the other. A good road runs from Chase as far as Chase creek in sec. 30, tp. 21-12-6 where it divides, one part going south to China valley, and the other east to Squilax. Both roads are in good condition. The soil is a sandy loam and very dry. There is very little rainfall and irrigation will have to be adopted for better results in farming operations.

On July 28, I moved to Malakwa, in tp. 23-6-6. The work in this township consisted of subdividing the sections into legal subdivisions. Work was done also in townships 22, ranges 6 and 7. In all, about fifty miles of subdivision and retrace-ment were run in these townships. Eagle river runs through all three townships, and the valley is about a mile wide on either side. I was able to move my camp by wagons, hired locally, as a good wagon road runs from Solsqua to Craigellachie.

On September 8, having completed this subdivision, I moved camp by rail to Revelstoke, where I obtained three large canoes and commenced a stadia traverse of Columbia river and islands, from Revelstoke to the southern limit of the railway belt. This was completed on October 12. While on this work some subdivision was done in tps. 22 and 23-2-6 and in tp. 22-1-6. Several sections were cut up into legal subdivisions. A wagon road is being built from Arrowhead to Revelstoke, but it will not be completed for several years. There are quite a number of settlers, along Columbia river, who are gradually getting their homesteads cleared. The soil is a sandy loam, suitable for general farming.

My next work was in tp. 23-1-6 which was reached by wagon from Revelstoke. Section 31 was surveyed into legal subdivisions. Most of the township is mountainous.

On completion of this work, camp was moved by rail to Chase where I divided my party, one assistant going south by wagon to tp. 20-12-6 where a school-site was laid out on Charcoal creek, while the remainder of the party went by launch to Celista in tp. 23-10-6. A townsite was laid out along Shuswap lake in section 9, through which a new government road runs. The land in this township is being rapidly settled.

On October 27 camp was moved, by launch, to tp. 22-12-6. The boundaries of section 26 were retraced and re-established, and the left bank and islands of Adams river were traversed. The course of this river has changed considerably since the last traverse was made, and these changes have formed several islands in Little Shuswap Lake Indian reserve No. 1. On October 31 I moved camp to Chase by launch, and disbanded my party, and the following day with one assistant, I left for Revelstoke, where I made a tie between a concrete longitude monument and the east boundary of sec. 34, tp. 23-2-6.

On November 5 I returned to Vancouver, having completed my season's work.



## APPENDIX No. 39.

## ABSTRACT OF THE REPORT OF G. J. LONERGAN, D.L.S.

## INSPECTION OF SURVEY PARTIES WORKING UNDER DAILY PAY.

My first work was in northern Manitoba in the vicinity of Pas.

This town has now a population of about 1,500 and is equipped with modern improvements such as waterworks, a sewage system and electric lights. The Finger Lumber company has there one of the best equipped sawmills in western Canada, employing about 300 hands. Most of the logs are brought in on Saskatchewan river.

The Hudson Bay railway has in operation a mixed train service from Pas to the end of steel, about 170 miles north, and the grade is completed about sixty miles farther. The country from Hudson Bay Junction on the Canadian Northern railway to about 160 miles beyond Pas is mostly low and flat and is covered with about two feet of moss. The timber on this area is mostly scrub, spruce and tamarack with occasional poplar ridges. Some spruce is large enough for milling. Many lakes are scattered through this district and all of them contain fish. No trails of any consequence exist and horses are of little use. Transportation is carried on by means of dogs in winter and canoes in summer.

When the work in northern Manitoba was completed I went to British Columbia and inspected eight parties working in the railway belt. Upon the death of Mr. A. E. Hunter, D.L.S., who was drowned in Nahatlatch river, I took charge of his papers and placed his assistant, Mr. W. H. Norrish, D.L.S., in charge of the party.

I then returned to the prairie provinces and inspected a number of parties working there. I visited in all thirty-one survey parties, investigating all details such as the kind of board supplied to the men, the suitability of the men for the work they were performing, the condition of the transport and the price paid for it, the manner in which the field work was performed and the condition of the field notes and diaries. All the chains were tested and the condition of all instruments used was reported on.

In travelling over the country I was agreeably surprised to find that large areas of land which eight or ten years ago were only grazing leases are now dotted with home-steads; old trails which used to run across the country are replaced by graded roads which follow the regular road allowances; old fords of creeks are now substituted by steel bridges, and many towns have sprung up and become business centres. Telephones are installed in most of the farm houses; rural mail delivery has been established and all the communities show progressiveness. Farmers are also going into mixed farming to a great extent and are erecting more comfortable dwellings and out-buildings. The planting of trees and shrubs is also receiving more attention, and some of the homes have a very attractive appearance.



## APPENDIX No. 40.

## ABSTRACT OF THE REPORT OF H. MATHESON, D.L.S.

## TOPOGRAPHICAL SURVEYS NEAR JASPER.

Jasper is situated in tp. 45-1-6, on a broad flat near the junction of Miette and Athabaska rivers. It is the administrative centre of Jasper park, and is on the main lines of both the Grand Trunk Pacific and Canadian Northern railways, being the second divisional point west of Edmonton on the Grand Trunk Pacific. It consists of a fine park administration building, artistically constructed of boulders, also three stores, and numerous small but generally attractive dwelling-houses. The tents and rough shacks built during the days of railway construction, before the townsite was surveyed, are gradually disappearing. The population of Jasper consists mainly of people employed by the Parks Branch and employees of the Grand Trunk Pacific railway.

In the latter part of 1913, I had commenced the survey operations necessary to make a topographical map, on a scale of ten chains to an inch, of an area in the valleys of Athabaska and Miette rivers, approximately five miles below and five miles above Jasper, and had surveyed many of the lakes and waterways, by means of the transit and stadia. In 1914, I completed the work, using a plane-table.

My topographical surveys were controlled by the section lines of the township subdivision. The sections were divided into smaller areas by transit stadia traverses. The section lines and traverses were plotted on the plane-table sheet in camp, and the elevations of the stations marked. The stations were then occupied by the plane-table. Stadia readings were taken on suitable points with the telescopic alidade, and the points plotted on the plane-table. The stadia readings were reduced in the field by means of a slide rule, and the contours were sketched on the map in the field. The table was oriented by means of the magnetic needle. Besides occupying stations already located, traverses were also run by plane-table and stadia, closing on the transit traverses or section lines. By these means the whole area was surveyed and contours with intervals of ten or twenty feet, depending on the nature of the country, were accurately located. Shores of lakes and rivers were traversed by transit and stadia, and plotted on the plane-table sheets in camp. As data for levelling, I used the Grand Trunk Pacific railway bench-marks. From these, lines of levels were run along roads and trails throughout the area surveyed, and bench-marks were established on which I checked my traverses whenever convenient or necessary. The plane-table work required four men, consisting of a topographer, a recorder and two rod men.

During 1913 and 1914 much development work was done in Jasper and vicinity by the Parks Branch. The streets of the town have been graded and gravelled, and a wagon road has been constructed to Patricia and Pyramid lakes, two magnificent sheets of water more than a mile long in the hills north of Jasper. An excellent automobile road, which winds by many beautiful small lakes, has been constructed as far as Maligne gorge. Pack-trails have been constructed almost to the summits of Goat and Maligne mountains, to Caledonia, Cabin, Medicine, Maligne and Jack lakes, and to many other parts; a temporary wooden bridge has been constructed cross Athabaska river near Jasper. Packers and guides, competent and fully equipped to take charge of tourist parties, are now located at Jasper, and it is possible to travel comfortably from Jasper road along good roads and trails into some of the finest mountain scenery in America.



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The area surveyed included the flats of Athabaska and Miette rivers, and the rolling country between these flats and the mountains. One of the most noticeable features of the area is the large number of small lakes scattered over it. This is, of course, an important asset to the attractions of the district, and full advantage is being taken of it by the Parks Branch in the development of this part of the park. All roads are so located that they touch at least a portion of the shore of every lake situated in the general direction of the road. Many of the lakes have no outlet or inlet, and are only large ponds, while others have outlets and inlets either on the surface or underground, and some of the latter contain fish. The best fishing is to be found in Caledonia lake, which in summer is visited almost daily by residents of Jasper and by tourists. Pyramid lake and Athabaska and Miette rivers also provide good fishing.

Maligne gorge, a narrow canyon on Maligne river, is one of the most important scenic attractions in the vicinity of Jasper, and is included in the area surveyed. Its distance from Jasper by road is about ten miles. Maligne river flows northeasterly from Maligne lake, and enters the Athabaska about four miles below Jasper. The gorge is about a mile above its mouth, and just above the point where Maligne river enters the flats of the Athabaska. The gorge, which is approximately half a mile in length, is in places not ten feet wide at the top, but has been eroded by the action of the river water on the soft sedimentary rock to a depth of more than a hundred feet. The river enters it by a cataract and a fall of about seventy-five feet. It is remarkable that only a small portion of the water of Maligne river flows through the gorge. The stream flowing through the gorge is only about twenty feet wide in high water, above its entrance to the gorge, and it is said to become dry in winter. The main volume of the water flows underground about eleven miles from Medicine lake to a point just below the gorge, where it comes to the surface and with the water which flows through the gorge, forms a river about a hundred feet wide. Near the gorge, a rest house has been built, and a trail has been constructed leading up to Medicine, Maligne and Jack lakes. A foot bridge has been constructed across the gorge in such a position as to afford a good view of the falls and the bottom of the gorge.

I completed topographical work in the vicinity of Jasper on October 21 and then moved my outfit to Pocahontas by train. Thence I moved by wagon to tp. 49-26-5 where I surveyed a block of land consisting of eleven legal subdivisions, to be leased to the Northern Alberta Coal syndicate. It was necessary to run nearly six miles of section lines, on most of which the cutting was very heavy.

I completed the above work on November 3 and disbanded my party, and after surveying a corral near Jasper, and placing some iron posts in Jasper townsite, I closed operations for the season.



## APPENDIX No. 41.

## ABSTRACT OF THE REPORT OF P. MELHUISH, D.L.S.

## SURVEYS IN THE NEW WESTMINSTER DISTRICT, BRITISH COLUMBIA.

My season's surveys were begun at Bedwell bay where I retraced road traverses, and marked lot and block corners of the additional subdivision at Woodhaven.

On June 2, I moved to Pitt lake to make a survey of a parcel of land in secs. 18 and 19, tp. 5-4-7. This land was required for industrial purposes, water-power being available from Raven creek.

We next moved to Harrison Mills in tp. 3-30-6 and produced the Seventh meridian northerly to the northwest corner of section 29. After completing other section lines to the north of Harrison bay, and retracing the boundaries of Harrison River Indian reserve No. 3, we ran the east boundaries of sections 21, 16 and 17, and the north boundaries of sections 15 and 16, over the mountain between Harrison bay and Fraser river. Part of my work in this township was to traverse both banks of the Fraser and all the islands in the river which had not been previously surveyed. At this time, however, the river was in flood, and I considered it would be more expedient to do this work later in the season when the river would be easier to cross.

On July 20 I moved from Harrison bay to the south end of Harrison lake, where I pitched camp in tp. 4-29-6. Several section lines were surveyed and retraced in this township and a small parcel of land was surveyed on the west shore of Harrison lake. This land was required for the building of a summer house and is very desirable for this purpose. Some good land in sections 12 and 13 has never been cleared. There is a hotel and a small village at Harrison Hot Springs and motor stages meet the trains at Agassiz station.

The next work, in tp. 3-28-6, consisted in traversing a part of Maria slough and running section lines to close this traverse. There is some good soil in the west halves of sections 24 and 32; the land is all on the mountain sides but the soil is a deep chocolate loam. In the middle of August it contained ample moisture, after six weeks of dry weather. The mountain side has been burned over and there is a fairly heavy growth of birch and alder. The land around Agassiz is being steadily improved and presents the appearance of a thriving community of farmers. On August 14 camp was moved to Fraser river in section 18. From this camp four islands in the river were surveyed in sections 15, 16 and 18.

On August 19 I moved the party back to Harrison Mills where the work which I had left a month before on account of the water being at its height, was taken up again. Some ten islands in the Fraser, and the banks of the river in sections 23, 24 and 13 were traversed. Several section lines were surveyed and corners which had been washed away by the river were re-established in safe places. The action of Fraser river in removing land from one place and building it up in another is extremely rapid and difficult to predict. The river drains a large snow-covered area and is very swift. The last abnormally high water was in 1904, and owing to dredging operations near the mouth, similar conditions are not expected to occur again. The fact that there is a possibility of almost any of the islands in the river being flooded has probably been the cause of settlers not taking up this land. The soil on the islands is sandy loam, but with proper cultivation it would be suitable for agriculture.



## SESSIONAL PAPER No. 25b

The sequence of growth on land which is being built up on the Fraser seems to be invariably the same, namely: willow, alder, cottonwood and cedar. Some of the islands have very large cottonwood trees whose roots help to hold the soil in its place. Cottonwood is valuable, and when dry is hard and almost impossible to split. It is used for making furniture and boxes. There is a sawmill situated in tp. 24, E.C.M., which saws this wood exclusively.

On September 20 I moved camp from Harrison Mills to Coquitlam river to survey timber berth No. 562 and also part of the north boundary of tp. 39, W.C.M. The northeast corner of section 33 was 3,000 feet above the camp. The berth contains some very fine cedar, ranging from two to six feet in diameter. There is a heavy growth of sound hemlock, but the fir is scattered. Logging roads can be built through the berth, as the ground in most places is not unfavourable to logging operations. While surveying this timber berth the rain and fog rendered the work exceedingly slow. This district has an exceptionally heavy rainfall. During the time that we were there, between September 21 and October 25, inclusive, the total rainfall at Coquitlam lake was 18.53 inches. The survey of the berth was finished on October 25, when the party was moved back to Harrison Mills. Camp was pitched in tp. 3-30-6 and that part of Queen's island situated in this township was traversed, together with the right bank of Fraser river in sections 9, 15 and 16, and the left bank in section 14.

On October 31 the party was moved to Harrison Mills and paid off, and after correcting the position of some posts on the resurvey of Langley townsite I closed operations.

The weather in the months of June, July and August was very good for survey operations, but rather too dry for the farmer. The rainy season started on September 7 and from that time on more rain than usual fell. From April 23 to September 6 three days were lost on account of rain, while from September 7 to October 31 twelve days were lost.



## APPENDIX No. 42.

## ABSTRACT OF THE REPORT OF R. B. McKAY, D.L.S.

## LATITUDE OBSERVATIONS IN NORTHERN ALBERTA.

During the past season I observed for latitude on the Fourth meridian near lake Athabaska, on the Fifth meridian near where it crosses Peace river, and on the Sixth meridian near the 21st and 23rd base lines.

The party consisted of myself and one assistant, and for transport we had a canoe, a small dingey and a portable gasoline motor which could be readily attached to the dingey.

Leaving Athabaska on May 8 we overtook the Hudson's Bay company's transport at Grand Rapids, and transferred our outfit to their scows for transport through the rapids. We reached McMurray on May 23, where we left the Hudson's Bay company's scows and proceeded down the river in our own boats, reaching lake Athabaska on the 30th.

The ice on the lake detained us for a few days, but on June 6 we left for the Fourth meridian, and, after travelling through twelve miles of ice, reached the meridian five days later.

The land in this vicinity is fairly level, dry and sandy, and is partly covered with jackpine, which has recently been burnt over. Several small hay meadows lie along the valley of a creek which enters lake Athabaska near the meridian. These places appeared to be a breeding ground for mosquitoes which were very plentiful, active and annoying during my stay at the meridian. Foxes are quite numerous in the district, but no other game was noticed.

I completed my observation here and started for Chipewyan on June 27. The water in the lake was considerably higher than it had been two weeks previous, and not so clear, as Peace river was sending large quantities of drift-wood into the lake. Being favoured with calm water, I reached Chipewyan on June 28, making the trip from the meridian in seventeen hours actual travelling.

Chipewyan is a trading centre for the Chipewyan and Cree Indians who trap and hunt in the vicinity of lake Athabaska. The land included in the settlement is very rocky and although a few patches of potatoes are grown, very little of it can be used for gardening. There is plenty of game and fur in the district and the lake abounds in fish, thus making it an ideal country for a hunter or trapper.

On July 4, I left Chipewyan for the Fifth meridian on the Hudson's Bay company's steamer *Grahame*, which was making its annual trip to Vermilion chutes on Peace river. The route taken to reach Peace river was through the Quatre Fourches channel which is about 200 feet wide and connects lake Athabaska and Mamawi lake with Peace river. The country it runs through is low and flat, and timbered with patches of good spruce, while large quantities of hay are found around the shallow lakes to the west. The lower part of Peace river traverses a rich agricultural country, and its banks and the islands in the river are well timbered with spruce, birch and poplar, and vast prairies with unlimited hay meadows exist a short distance from the river on either side. Large quantities of gypsum are exposed in many places on both banks, particularly near Peace point. At what is called Little rapids, the current is very swift while the water is shallow with a gravelly bottom; these rapids, however, are navigable except at low water. The banks as a rule are low and are frequently



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undermined by the strength of the current at high water, which occurs in the latter part of June. I left the steamer *Grahame* about six miles west of the Fifth meridian and with my outfit drifted down stream to the line, choosing the place of observation on the north bank of the river. The current there is about three or four miles an hour, and the banks which are well timbered with spruce, birch and poplar, are about twenty feet high. Thunderstorms and showers were quite frequent during my stay, and the aurora was very beautiful.

On July 27, I completed my observation, loaded the outfit in the canoes and started up Peace river, using the motor. We reached Red river, where there is a small settlement, on the 30th, and the same evening camped on the south bank of the river at Vermilion falls. There it was necessary for us to portage our outfit, but, as the water was low, we were able to get within ten feet of the falls and portaged the outfit about 100 feet. Between the falls and the rapids a distance of about a mile and a half, we tracked the canoes singly as the current is very swift, and again portaged the outfit a distance of about 300 feet over the rapids. In these falls and rapids there is a drop of about twenty-five feet. They constitute the only obstruction to navigation on Peace river below Hudson Hope. They could be made the source of a great amount of power, but there is no market for it at present. There is a road extending from Red river to Steamboat landing, a mile west of Vermilion rapids, over which the Hudson's Bay company transport the freight from one steamer to another, and during this season surveys have been made for a proposed tramway on the north side of the river to overcome these falls and rapids.

Near Vermilion rapids on the south side of the river, a few settlers were clearing land at the time of my visit. Above the rapids the current is swift for about a mile, and then slackens considerably. On August 4 we reached Fort Vermilion, where I decided to await the arrival of a steamer which was expected shortly. The vast stretch of level country in this vicinity has great agricultural possibilities, and a visit to Mr. Jones' experimental farm will convince one that all kinds of grain and vegetables can readily be grown and ripened in this section. However, the majority of the settlers are trappers and hunters, and do very little farming. On August 14 there was a slight frost at Fort Vermilion, the first of the season. I left there on the steamer *Peace River* and reached Peace River Crossing on August 19, after having travelled over 1,100 miles by water.

At Peace River Crossing Mr. A. L. Cumming, D.L.S., who was working in the vicinity, furnished me with his packer and four horses, which, together with five others, constituted the pack-train by which I was able to transport my outfit to the location of my next work on the Sixth meridian, near the 23rd base. To reach this place an old trail, which passed near the easterly end of Bear lake, was followed as far as section 10, township 87. We then travelled westerly along section lines to the meridian and northerly on the meridian. The heavy windfall in township 88 necessitated considerable cutting before the line was made passable for the horses. The place of observation was reached on September 5 and I completed my observation on the 18th, the following day from twelve to fourteen inches of snow fell, the weight of which broke many trees, mostly poplar and birch, in the vicinity, and made travelling difficult. I returned to Peace River Crossing for supplies on September 27, and then left for the Sixth meridian near where it crosses Peace river, which was the location of my next work.

I reached the place of observation on October 3, and being favoured with good weather I completed my observation and returned to Peace River Crossing on the 15th.



## APPENDIX No. 43.

## ABSTRACT OF THE REPORT OF J. H. McKNIGHT, D.L.S.

## STADIA SURVEYS IN EASTERN SASKATCHEWAN.

We commenced operations for the season by traversing Big Quill lake in tp. 35-17-2. We found the water in this lake to be very high, and as the land rises gradually from the lake, a slight change in water level greatly alters the shore line. After completing the traverse of the lake in this township, this work was postponed on account of the high water.

Investigations were then carried on in tps. 35 and 36-19-2. and tp. 36-18-2. This district is well settled, and the roads are well graded and in good condition. The crops were very good, although the summer season was hot and very dry.

During July townships 37 and 38, ranges 18 and 19, and townships 36, 37 and part of 38, range 17, were investigated. Through this district the only good roads run north from Englefeld, Watson and Wimmer railway stations, and some difficulty was experienced in finding trails running east and west. The country is partially settled, and there is considerable poplar bush for firewood and building purposes. An abundance of hay grows around the lakes and sloughs, and on the higher land there is a rank growth of peavine and other grasses. These townships are especially adapted for mixed farming.

Townships 36 and 37, range 16, township 36, range 15, and township 35, range 14, were next investigated. The country is covered with large areas of small poplar and willow, and is suitable for mixed farming.

On August 15, I moved camp to Fishing lake in tp. 33-12-2, and also investigated townships 31 and 32. This district is well settled and the farmers are very prosperous. Nearly all have gone in for mixed farming or ranching, especially cattle ranching. Most of the hay for winter feeding is obtained around Foam lake, where there are large areas of splendid hay land, from which hundreds of tons of hay are cut each year. This work was completed on September 8.

We then proceeded to investigate the fractional sec. 7, tp. 33-18-2, going by way of Quill Lake settlement for supplies. This township is gently undulating prairie and is fairly well settled. The crops were below the average owing to the dry season and an early frost. The water in Big Quill lake was still very high and no other traverse was made in the township.

The next work was the investigation of tp. 37-15-2 and part of Ponass lake in tp. 38-14-2. This finished our work in this district.

On September 28 we left to make a traverse of Connell and Harehills creeks, on the west boundary of the Pasquia Forest reserve. From tp. 40-5-2 I followed the summer trail which runs northwesterly through a heavily timbered country and crosses Barrier river on the Kinistino Indian reserve. I then proceeded through a settled country to Arborfield in tp. 47-12-2, by way of Tisdale, a busy town of 350 population. The roads through this district are nearly all graded and in good repair. Prairie and bush fires were burning throughout the country, doing considerable damage, but were checked and stopped by rains commencing on October 2.

From Arborfield I took a winter road, newly cut out, to Connell creek in tp. 48-10-2. Owing to difficulties in making this traverse, and wet weather, this work was not completed, and on October 12 I closed operations for the season.



## APPENDIX No. 44.

## ABSTRACT OF THE REPORT OF W. A. A. McMASTER, D.L.S.

## RESURVEYS IN THE PRINCE ALBERT DISTRICT.

My first work for the season, which was commenced on July 16, was the resurvey of tp. 46-25-2. This work did not make very rapid progress, as nearly all the monuments were lost or obliterated; it was, however, finally completed on August 24. The Canadian Northern railway runs through sections 32, 33, 28 and 21 of this township, and a ferry crosses Saskatchewan river at the southwest corner of section 22.

After completing this work I left for Sturgeon lake to survey a part of tp. 51-1-3. This lake which is an expansion of Sturgeon river crosses Sturgeon Lake Indian reserve No. 101 which covers the central and southeastern parts of the township. It is a long narrow body of water and is dammed at the east end to store water for driving logs down Sturgeon and Shell rivers. When I was there the sluice was open so that the lake was at its normal level. The rainfall in this district was abundant, as it rained every day except one while I was there.

I next moved to tp. 47-28-2, and after retracing this township I retraced parts of tps. 47 and 48-27-2, the north boundary of tp. 47-26-2 and Prince Albert settlement as far east as river lot 54. I ran trial lines as far as river lot 75 but only temporary monuments were planted.

River lots 55 to 59 inclusive of this settlement form part of the Saskatchewan Penitentiary reserve, and all east of this is occupied by the city of Prince Albert. The surface is generally level or inclined to be rolling. About thirty per cent of the land is covered with poplar and willow, about one-half of which has been killed by fire. The rest is open prairie or has been cleared. The soil is sandy loam, and is well adapted for farming or market gardening. The settlers are engaged in mixed farming and dairying, both of which appear to be a success. Some sloughs, most of which have hay land around them were seen, but no timber grows except poplar up to six inches in diameter, which is fit only for fuel. Saskatchewan river runs along the north of the settlement, and two small creeks flow into it. One crosses the Third meridian about a quarter of a mile south of the base line and runs in a northeasterly direction, the other runs through river lots 15 to 18, also in a northeasterly direction. Each is about ten links wide and has a valley about fifty feet deep. At the time of survey neither was running. There is a descent of about a hundred feet towards the river and the land below is flat and wooded with small poplar and willow, except where it has been cleared. The slopes are generally easy, but where steep they are wooded with poplar, birch and some spruce. The climate was mild and the rainfall sufficient. Jumping deer were noted and also one bear. Of the fur-bearing animals, coyotes, foxes, and muskrats were seen. Ducks, partridges and chickens were plentiful.

About an inch of snow fell on November 6, and on the 12th it came to stay. On that date I ceased operations for the time being, and discharged the party. On February 11, 1915, I commenced the traverse of the river through the settlement beginning at the Third meridian and working east. I completed this traverse on the 15th.



## APPENDIX No. 45.

## ABSTRACT OF THE REPORT OF A. M. NARRAWAY, D.L.S.

## OUTLINE AND BASE LINE SURVEYS EAST OF LAKE WINNIPEG.

My work for the past season consisted of the survey of the north boundary of tp. 20-10-E, and of a continuous line made up of base lines and township outlines from township 48 on the Principal meridian south to tp. 37-3-E.

We left Selkirk on May 16 and proceeded by boat to Little Black river in tp. 21-9-E. We paddled up this river to our first work in tp. 20-10-E.

Little Black river at its mouth is about twenty chains wide and eight feet deep. About a mile from lake Winnipeg the north and south branches join. The former contains about twice as much water as the latter, but both of these branches are navigable for canoes, although in many places fallen trees have blocked the channels.

When this work was completed we travelled by steamer to the mouth of Big Black river, and on June 8 commenced work at the northeast corner of township 48, on the Principal meridian. We surveyed the 13th base line, first west to the lake shore, and then east across range 1, east of the meridian. From there we turned south and surveyed the east boundary of range 1 to the 12th base, and thence east along this line across ranges 2 and 3.

Big Black river varies in width from four to eight chains, and contains very dark soft water, indicating muskeg origin. It is navigable for tugs for about four miles from the mouth. Lake steamers call at this river during the fishing season. This year the water was very low, and the large steamers had some difficulty in passing over some hidden reefs in the channel.

In township 46, Poplar River Indian reserve and Poplar river itself were crossed in sections 36 and 25. There is a strip of good land along the river in this reserve, most of which is still covered by trees, and few gardens were seen. The Indians whose homes are on this reserve spend most of their time during the summer at Big Black river, where a few of them work for the fishing companies.

Poplar river is about three-quarters of a mile wide at its mouth, but narrows upstream to an average of about five chains. There is no perceptible current and not many rapids, making it a very serviceable river for transporting supplies. It is not very deep, and only tugs can enter it. It passes through a large lake lying partly in tp. 44-6-E. This lake is known as Thunder lake, deriving its name from an old Indian legend concerning a high rock ridge a short distance to the south of the lake. From this ridge the country can be seen for miles around. It seems that there are some large boulders piled on this ridge which resemble a huge nest, and it is claimed that young thunder is born there, and that it can be heard echoing and re-echoing among the rocks.

On August 29 we turned off the 12th base line and surveyed the east boundary of range 3 as far as township 37.

In township 44 our line crossed the west edge of Manybays lake. This lake is about three miles long, lying in a southeasterly direction, and drains into Poplar river from its east end by underground connections. There is considerable open floating muskeg around the lake and many rock ridges covered by jackpine and spruce. Many ducks were observed on this lake.

Leaf river which crosses the line in township 41 averages about three chains in width and fifteen feet in depth. It is a very pretty river, and very appropriately



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named. Its mouth during a season of low water on lake Winnipeg, is usually blocked up by a shifting sand-bar, which leaves a channel only about twenty feet wide and a few inches deep. At high water sail boats can enter from the lake. There are a great many rapids up-stream. Some promising stands of spruce and balsam were seen along its banks.

In sections 25 and 24 of township 39 the line crossed Berens River Indian reserve, and in sections 13 and 12 it crossed Berens river. The Indians living on this reserve were found to be a better class of people than those on the Poplar River reserve, and their homes were better looked after. Some good gardens were seen there and also some very good cattle. This year potatoes averaging 100 bushels to the acre were grown on the reserve. Some of the Indians are good packers as they are used to taking hard trips up Berens river with the Hudson's Bay company's freight.

Berens river has a slight current and varies in width from ten to twenty chains. It is very deep and the larger lake-steamers can run a considerable distance up-stream. Several years ago the government had a fish hatchery there, but this has been moved across the lake to Grand Rapids.

The line in township 38 struck lake Winnipeg in section 25, and crossed Pigeon bay, a distance of about four and a quarter miles. This was passed by means of a triangle.

Pigeon river which empties into this bay is much the largest river crossed by our lines this season, and if a lake-steamer could enter its mouth it is probable that it could run about ten miles up-stream. The mouth of this river is very narrow, being partly blocked by a shifting sand-bar, and no boat larger than a skiff can enter at low water, or a sailboat at high water.

On October 14 having reached the northeast corner of tp. 37-3-E, I closed operations and returned to the mouth of Berens river. From there we travelled by steamer to Selkirk where we arrived on the 21st.

The country covered by our surveys is usually level and is made up of a succession of swamps, muskegs and low rock ridges. As a rule these swamps are covered with a growth of stunted spruce and tamarack, and there is usually standing water on the surface. The muskegs are generally not very deep, and have a clay bottom with more or less muck. There is also a lot of deep moss muskeg which is dry and springy. The growth on this muskeg is generally scattered small spruce.

In some places where the lake cuts the edges of such a muskeg, moss seven feet deep was seen. The rock ridges are usually granite outcroppings often covered with a thin growth of spruce and jackpine.

The rivers entering the lake on the east side are very similar and have little current except at the rapids. In several places Big Black river widens out to nearly twenty chains and then narrows to about six feet, while Leaf river has rapids that can be crossed by a short step. The rivers usually are a succession of basins and short rapids.

Lake Winnipeg is known throughout America for its whitefish and sturgeon, and it was therefore interesting to see the actual fishing operations carried on. This year no sturgeon fishing was carried on owing to close season, but two companies were engaged in fishing for whitefish and pickerel. These companies have fishing stations at Big and Little George's island, Little Sandy islands, Big Black river and Warren's landing. At Big Black river and Warren's landing tugs as well as sailboats are used for fishing. Each company operates a freight and passenger steamer to collect its fish and bring them to Selkirk. These steamers aim at making two trips a week during fishing season which lasts from June 1 to August 15. After this date the Northern Fish company's steamer made one trip a week, carrying passengers. This steamer also calls at Berens river when it has any freight for that locality. During the fall pickerel fishing is carried on from skiffs, the catch being shipped to Selkirk in tugs,



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and in the winter whitefish are taken through holes in the ice. Many whitefish are cached in the fall by the Indians for dog feed during the winter.

While moose and deer are none too plentiful on the east side of the lake, yet there are enough to furnish food for the Indians in that district. There seems to be a fair number of fur-bearing animals in this district, including many black and silver foxes. While we were running the 6th base line during May, one of my men was fortunate enough to catch alive two black foxes, for which he received \$800.

Throughout the months of July, August and September, numerous forest fires crossed the district in which we were working. In some cases patches of good timber were burned. There are still some promising stands of timber which would be well worth saving, and as it is usually to be found along the rivers, which are well adapted for quick and easy travelling, it could be easily patrolled by firerangers.





Photo by J. A. FLETCHER, D.L.S.

#### RAFTING ON WABISKAW RIVER.

A raft constructed of dry logs held in place by cross pieces firmly lashed in position with cinch ropes, is useful over smooth stretches of river. This raft was large enough to carry the cook outfit and some 1,200 lbs. of provisions; it was floated down the Wabiskaw river from Tall Cree's place to the 27th base line. The men on the raft are carrying long poles for steering.



Photo by J. A. FLETCHER, D.L.S.

#### SWIMMING HORSES ACROSS WABISKAW RIVER.

As no horse feed grew on this side of the river the horses had to be taken to the other side. The men in the canoe are leading one horse and the others are crowded in with a rope.







## APPENDIX No. 46.

## ABSTRACT OF THE REPORT OF R. NEELANDS, D.L.S.

## STADIA SURVEYS IN CENTRAL SASKATCHEWAN.

My season's work consisted principally of the investigation of water areas and the stadia survey of permanent bodies of water in a block of townships about three ranges wide and extending about sixty miles south from Prince Albert. Over thirty townships were examined and all are somewhat similar in character. The surface is rolling and often hilly, covered in places with poplar and scrub and containing many small lakes and sloughs.

In many of these townships the road allowances are not opened up, and in only a few are the roads graded, as the homesteading is recent and some land is still vacant. A great many settlers are Ruthenians and French Canadians, nearly all of whom are engaged in stock raising and mixed farming.

Many of the lakes are alkaline but a few contain fresh water. Muskiki lake, which occupies a large part of the southwest portion of tp. 39-26-2, is saturated with salts, and in dry seasons is nearly viscid. The water is said to be beneficial in treating rheumatism, and the water of Muskiki springs, which are situated on the southeast side of the lake and which form its chief supply, are said to have valuable curative properties. Having finished the work in this block of townships, I left for tp. 44-22-2. The greater part of this township is included in the low area surrounding Waterhen lake and is an extension of Waterhen marsh. Few of the road allowances are opened up, but there is a graded road from Meskanaw, in the southern part of the township, to Kinistino, on the Canadian Northern railway.

On October 12, I moved to tp. 53-7-3, and on completing the work there returned to Prince Albert, where I discharged the party.

In general this whole district is rolling country, mostly covered with small poplar and scrub, and broken with many ponds and lakes. It is drained by Saskatchewan and Carrot rivers. Hay, wood and water are abundant, and it is fairly well provided with roads and railways. It is first-class agricultural land, and farming is the only industry engaged in by the settlers. About seventy per cent of the land is settled by various European nationalities, who seem contented and prosperous.

Although the season was unusually dry and favourable for stadia surveys, few sloughs were completely dry, and only two section lines were retraced and one monument erected. Three hundred and twelve lakes, ninety-nine islands and a part of Saskatchewan river were traversed. Many sloughs and marshes were also investigated.



## APPENDIX No. 47.

## ABSTRACT OF THE REPORT OF W. H. NORRISH, D.L.S.

## SURVEYS IN THE VICINITY OF LYTTON, BRITISH COLUMBIA.

Early in April, 1914, I was appointed as assistant to the late Mr. A. E. Hunter, D.L.S., and upon his death, on July 14, was placed in charge of the party.

The season's work was begun in tp. 11-26-6, where, after completing the necessary subdivision, ties were made to the Canadian Northern railway, which is now constructed from the coast to the bridge across Fraser river, six miles south of Lytton. Part of the left bank of the river was also traversed. Our work was nearly all on the east side of the river, but connections had frequently to be made to posts on the opposite side, necessitating triangulation.

There are four small Indian reserves on the left bank of Fraser river, in this township, and although the benches on which they are situated are small, the land, if properly tilled, would be exceedingly productive, as it has been demonstrated that almost anything can be grown there. Great success is attained with garden produce, including all sorts of small fruits. There are several homesteaders in this township, but most of them are on the opposite side of Fraser river, where the hills do not rise so steeply and where there is considerably more farming land along the river. Some of the settlers are starting orchards which promise fine results. The hardier fruits, such as apples, pears, plums, etc., are practically sure to be a success.

Transportation routes are limited. On the west side of the river a good wagon road runs from North Bend to a ranch about half a mile north of Chaumox siding on the Canadian Pacific railway. On the east, or left bank, the Yale-Cariboo road forms the route for transportation. Although cut up in places by the grading of the Canadian Northern railway, this road is passable through the greater portion of the township. The bridge over Stoyoma creek in section 2 has disappeared and the road has been spoiled by the railway construction south of there.

Our next move was to tp. 12-26-6, where we completed the subdivision surveys necessary to tie in the Canadian Northern railway, and to dispose of the lands recommended for survey, as well as considerable retracement work to define the boundaries of Boothroyd Indian reserves Nos. 5 and 6, and lot 3, G.I.C.G. We also traversed the left bank of Fraser river through the township, where not already done.

The soil is rich, sandy loam on the benches and hollows, and is exceedingly productive, but it should be irrigated to ensure the best results, as the summers are inclined to be dry. It is regrettable, also, that the country is so thickly wooded that an enormous amount of work is required to clear the land, while the timber is poor in quality.

On July 9, we moved northward and across Fraser river to the village of Keefers from where we made the necessary surveys on the west side of the river in township 12, range 26, and began the traverse of the right bank of Fraser river through townships 13, ranges 26 and 27. It was while running the north boundary of section 5 in tp. 12-26-6 that Mr. Hunter slipped over an embankment and was drowned in the rapids on Nahatlatch river. His body was not recovered until eight days later, when it was forwarded to Warton, Ont., for burial.

I was then placed in charge of the party and on July 24 again commenced the traverse of the right bank of Fraser river, in township 13, range 27. We finished this work on August 1, and on the 3rd moved camp to Dot station in the Nicola valley,



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to commence the second part of the season's work, consisting of surveys in tps. 13, 14 and 15-23-6, and tps. 15 and 16-24-6.

From this camp we made subdivision and retracement surveys in the northern part of township 14 and the southern part of township 15, range 23. In township 14 we completed the survey of the quarter sections adjoining the east boundary of Lower Nicola Indian reserve No. 10, and retraced the east boundary and part of the west boundary of the reserve. We also ran the 4th correction line from the NE cor. sec. 33, tp. 14-23-6, westerly to the SW. cor. tp. 15-23-6. We then subdivided the good lands in the southwest portion of township 15 lying west of Nicola river as well as sections 3 and 10 east of the river. The river was traversed where not already done and part of the east boundary of Lower Nicola Indian reserve No. 11 was retraced. Altogether, the work covered from this camp totalled nearly forty miles.

The country covered was mostly rough timbered hills, but benches of good agricultural land were found on some of these hills. The Nicola valley is very narrow, but what lands there are at the bottom of the valley are very good. The climate is very dry as this district is in the midst of the dry belt, and it is almost imperative that the land be irrigated. This season was exceptionally dry, and most of the streams which usually carried considerable water in the middle of the summer were practically dry.

The timber is mostly fir and pine frequently running up to thirty inches in diameter, and in some places considerably larger. Scrub, poplar, etc., are not as thick as along the Fraser, although we noticed occasional poplar swamps which contain good agricultural lands.

On October 2 we moved from Dot to tp. 13-23-6 and camped near lot 779, about four miles from Canford post office. In this township the subdivision of sections 27 and 28 was completed and some subdivision done in the southwest portion of tp. 14-23-6. We also retraced another portion of the western boundary of Lower Nicola Indian reserve No. 10.

On October 21 having completed the above-mentioned surveys, we went to Claperton which is the first station south of Spence's Bridge, on the Nicola Valley branch of the Canadian Pacific railway, and surveyed parts of sections 3, 10, 15 and 16 in tp. 16-24-6.

Practically all of this township seems to be suitable for grazing purposes as the hills seem to bear a fair crop of bunch grass. A high plateau is to be found on the west side of Nicola river, which contains particularly good grazing lands. The hills on the east side of the river, though rising quite steeply for several hundred feet from the river, have afterwards very moderate slopes and are covered with an abundant growth of bunch grass.

The timber is practically all pine and fir, with pine predominating. It is a scrubby variety though growing to a fair size.

We traversed both the right and left banks of Nicola river through the southern half of the township, and also did some retracement of Indian reserves.

I closed operations on November 3.

The weather on the whole could hardly have been better. It was exceptionally dry during the summer although excessively hot at times. Most of the rain fell after September 10 when it began to rain rather frequently.



## APPENDIX No. 48.

## ABSTRACT OF THE REPORT OF P. E. PALMER, D.L.S.

## SUBDIVISION SURVEYS IN NORTHERN MANITOBA.

After organizing my party at Pas, we left on July 4, 1914, by the Hudson Bay railway for tp. 63-13-Pr., where our first work was located.

In this locality subdivision was done in fourteen townships along the railway right of way from township 65, range 13, to township 70, range 7. The work was completed on January 30, 1915. I then returned to Pas and surveyed a small island in tp. 56-26-Pr., after which I closed operations for the season.

Pas is the distributing point for supplies to a large section of northern Manitoba and Saskatchewan. It has a large lumber and fish trade and is also a fur-trading centre. Should the newly discovered mineral areas around Beaver and Wekusko lakes prove valuable, Pas will also be a mining centre. Its present population is about 1,500. Two lines of steamers which ply on Saskatchewan river, furnish the chief connections with the trading posts.

In its general character the country covered by my surveys is but little suited for agriculture, though parts of it could, no doubt, be used at the present time. In this connection it is worthy of note that I saw wheat, barley and oats growing around an old railway construction cache, in tp. 69-7-Pr. The straw was exceptionally long and strong and the grain was well-ripened and not hurt by frost on October 5. I was informed that in 1914 frost came much earlier to the settled parts of Saskatchewan and Manitoba than it did in the country where I was working.

The deposits of peat and muck in the swamps and muskegs in this country are not so deep as those in similar areas farther south. As a rule, this soil is from six to thirty-six inches in depth, and if the country were drained, I see no reason why this land could not easily be brought into a high state of cultivation. There is but little timber in the country covered by my surveys, and that mostly confined to the shores of lakes and banks of creeks where there is drainage. The small spruce and tamarack growing in the swamps and muskegs does not attain sufficient size to be of value, but dies when it reaches a diameter of eight or ten inches. A scourge of green caterpillars visited this locality in August and completely denuded the tamarack of their leaves. This will probably have the effect of killing most of them.

Game is far from plentiful in this country; a few signs of moose, caribou and bear were observed, but only two moose were seen during the entire season. There are a few partridges, pinnated grouse, and ptarmigan, but no great number. Rabbits, however, are abundant, and foxes, mink and muskrats are fairly plentiful, while lynx, otter and marten are more rarely found. Several fine specimens of the black and silver grey fox were captured in this neighbourhood during the early winter. In this connection I would like to call attention to the practice of many trappers in putting out poison for foxes and other fur-bearers. Though this act is illegal, it is done to a large extent by trappers, especially foreigners, who have not the skill to capture their game in other ways. Much of the game so killed is never found, as it is covered by the drifting snow, or else, if found, the pelt is too often destroyed by ravens or mice. In view of our rapidly decreasing supply of fur it would appear that steps should be taken to stop this practice, and to prohibit the sale of strychnine and arsenic for this purpose.



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The numerous lakes in this district are nearly all well stocked with whitefish, jackfish, and mullet, and in Pakwa and Setting lakes pickerel are also taken. Several carloads of fish were shipped from Setting lake this winter as well as one from Kiski lake. A small net supplied enough fish for the requirements of my party during a large part of the season.

No trace of minerals was observed during the course of the survey, but the magnetic needle showed a difference in variation of nearly ten degrees between different observation points occupied during the season. A difference in variation of five degrees was observed in one instance where only one mile intervened between the observation points, which would indicate the presence of iron ore in large quantities. These irregularities were noticed to a greater or less extent at all points in my work. East of range 11, ridges of granite occur at frequent intervals. Some small veins of quartz were noticed at various places in these ridges, but no signs of gold were visible. The granite in this locality is said by the engineers of the Hudson Bay railway to be the hardest rock encountered in any part of Canada.

The snowfall in this district was quite heavy, there being about eighteen inches at the time of closing operations. It was noticed that the snow became deeper as one went north, and this I am told is the general rule in this part of the country.



## APPENDIX No. 49.

## ABSTRACT OF THE REPORT OF R. C. PURSER, D.L.S.

## MISCELLANEOUS RESURVEYS IN MANITOBA AND SASKATCHEWAN.

The scattered miscellaneous surveys on which I was engaged during the season of 1914 were mostly in settled districts. The party consisted of myself and one assistant, local help being procured where necessary.

During the season about thirty surveys and investigations were made, the length of time necessary to complete any one survey varying from a few days to three weeks according to its nature. For the most part this work lay in the southern part of the provinces of Manitoba and Saskatchewan, the greater part being in the latter province.

The season throughout was very favourable to our work, but was unfavourable to the farmers in many of the districts, the crops suffering heavily on account of the exceptionally dry summer that prevailed.

A considerable part of our work consisted of the establishing of section and quarter-section monuments in places formerly covered with water but now dry. This work is of considerable benefit to the settlers as it permanently and officially establishes for them corners which might otherwise be in dispute and subject to arbitrary determination by the parties themselves.

In some cases whole lakes of considerable size had dried up since the original survey and in these the section lines were run and the corners perpetuated by monuments. One of these was Whitebear lake lying in tp. 24-15-3 and extending into the surrounding townships. This lake bed was yielding large supplies of wild hay at the time of the survey and already part of it was being made ready for cultivation.

Another class of work of equal importance with the above was resurveys for the purpose of locating corners, the original monuments for which were either lost or not in the position where they should have been according to the official plans of the township. In order to make any correction in these cases it was necessary to conform to section 57 of the Dominion Land Surveys Act which requires the written consent of the owners affected by the alteration. In some cases where this could not be obtained, nothing could be done towards a correction of the existing errors and retracements only were made for the purpose of putting the correct chainages and bearings upon the official plans.

Other work of various natures was undertaken consisting of retracements, investigations and correction surveys of different kinds. Magnetic observations were also taken, both for magnetic dip and total force, in every place where it was possible to do so without interfering with the regular work. My season's work in the field extended from June 1 until the end of December.



## APPENDIX No. 50.

## ABSTRACT OF THE REPORT OF C. RINFRET, D.L.S.

## STADIA SURVEYS IN SOUTHERN SASKATCHEWAN.

During the past season my work consisted of stadia surveys in thirty townships south of Moosejaw, and mostly along the Weyburn-Lethbridge branch of the Canadian Pacific railway.

The district was, in general, well settled, very few homesteads being vacant, and the roads are all in good condition.

The surface is mostly level, though rolling in places, and the soil is well adapted to mixed farming. Water seems scarce in some localities. There was a fair rainfall in townships 9, ranges 21 and 22, but elsewhere it was not sufficient. The district seems well suited for ranching where water for the stock is available.

The district north of Twelvemile lake, just west of the Third meridian, with the exception of a strip about a mile in width along the water, which is cut up by coulees, is rolling and suitable for farming. It is well settled. The southern part is rather hilly, and ranching is more successful; it is yet only sparsely settled, and a number of good homesteads are available.

My last work was in tps. 12 and 13-27-2. These townships are hilly and have many small lakes and sloughs. Ranching is carried on there to a small extent.

Although this district had much less rain this year than usual, 268 lakes and sloughs were found and traversed; the most of them are small, not over three feet deep and had potable water. Generally as soon as the land surrounding these lakes is cultivated the lake beds rapidly decrease in area. Sixty-six section corners previously under water were found dry, and the necessary section lines were run, and the monuments erected.

The crop was poor this year on account of the lack of rain, and what did grow was considerably damaged by a heavy frost early in August.



## APPENDIX No. 51.

## ABSTRACT OF THE REPORT OF O. B. ROBERTS, D.L.S.

## STADIA SURVEYS IN CENTRAL ALBERTA.

On June 1 we commenced our season's operations in tp. 42-9-4. Our work was at first retarded owing to heavy rains and the flooded state of Battle river, which rose eight feet above its normal height, and this flooding together with the heavy growth of bush and undergrowth along the river banks forced me to postpone its traverse through the various townships in which I worked, until a more favourable opportunity should present itself. I decided to wait until the work could be done on the ice, but as I closed operations before that time it was left undone.

The territory in which I worked may, for convenience of description, be divided into groups.

The first group comprises all the territory from townships 39 to 42 inclusive in ranges 9 and 10, west of the Fourth meridian.

This district is very rolling with numerous bluffs of poplar scrub. It becomes gradually less rolling towards the south, until in township 39 the surface is gently undulating. There are numerous sloughs in this block, which produce unlimited quantities of hay.

The soil in township 42 is very sandy and accordingly is not well adapted to farming. Under the most favourable conditions the crops are very light. Farther south the soil becomes heavier, and in township 39 it is too heavy for such low-lying country. Here the crops are very late, and in most cases become frozen before they are ready to be harvested. As a result of these different drawbacks, there is not very much of this block under cultivation. In the southern part of the block, oats is the predominating crop. Barley ranks next, while very little wheat is grown. The oat crop is, in many cases, harvested while yet green, and used as winter fodder for the cattle and horses, the raising of which is the chief industry, as the grazing facilities in this district are unequalled anywhere. The raising of hogs is also an important branch of agriculture.

The railway facilities of this district are about as good now as they are likely to be for many years, except, perhaps in township 39, where the new Canadian Pacific railway branch line from Coronation northwesterly is under construction. This line has been under construction for a number of years and in the opinion of the settlers it is not likely to be completed for some time.

A branch of the Canadian Pacific railway passes through township 42 in this group and at the present time is the only outlet from these parts.

The valley of Battle river is so wide here and so hilly that wagon transportation is quite difficult. The roads are fair and are kept in good repair, although very rolling as is natural from the rolling condition of the country. Two steel bridges span Battle river in this district, one near Hardisty and the other in township 41. From these bridges trails strike out in many directions, following in all cases the lines of least resistance. This plan is greatly simplified by the almost entire absence of fences. There are also very fair trails on either side of Battle river running throughout the district, and giving an excellent outlet from the interior parts of the district to the town of Hardisty.

With the exception of tp. 39-9-4 Battle river traverses all the townships in this district. This stream is very winding and muddy. It is from one and one-half



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to four chains wide, and has a current of from one and one-half miles at low water to about five miles per hour at flood. Its valley is very deep, rugged and wide, especially on the east bank where broken country extends eastward for two or three miles. This valley is from 250 to 300 feet deep, and at the bottom of the valley especially near the river bed are many muskegs and marshes which are very dangerous to stock. There are also many quicksand beds along the shore, which are extremely dangerous.

The problem of water supply is an easy one. The average depth of wells is from ten to twenty feet, and the numerous sloughs and lakes make it unnecessary to dig wells for watering the stock.

Generally speaking this block is best suited for stock raising and dairying, but enough grain can be grown to supply local requirements.

The second group comprises all those townships adjoining the north bank of Battle river and northward to the north boundary of township 42, and from ranges 11 to 17 inclusive.

The surface of this area, apart from the river valley is gently rolling prairie. The river valley here is quite narrow and seems to break off abruptly into a prairie country. There is not the same gradual change from very rolling to level prairie as there is in the former area. Township 41, range 16 and township 42, range 17 are, however, cut up by large coulees.

The soil is a clay loam, very well suited for grain growing, and splendid crops were seen. The townships in ranges 11 and 12 are seemingly the most prosperous in this district. This is partly due to the fact that the Canadian Pacific railway has settlements here, on its improved farms. The greater part of the district is under cultivation, the principal crops being wheat and oats. Considerable barley is also grown for hogs, the raising of which is an important branch of farming. The growing of wheat, however, is the predominant feature. Dairying is also carried on to a limited extent.

The different municipalities have constructed excellent trunk roads from Battle river to the important towns on the railway. These roads are kept in excellent condition. The various roads in the interior of the group, although not as well kept, are still quite passable. They all lead by the most direct route possible into the trunk roads. Practically all the road allowances have been opened, and in several cases the "blind lines" have also been opened up to give better transportation facilities to the settlers.

The rural telephone is used extensively throughout the district.

Battle river, already described, flows through the southern part of this district. Across it are two steel bridges, one near Cranmer in tp. 39-12-4, and the other near Loveland in tp. 40-14-4. Fords are also found at various places.

The lakes in this district are very limited in number, the most important one being Goose lake in township 42, range 11. There are many sloughs, however, which produce excellent hay and pasturage.

Numerous coal mines are also found along Battle river. Probably the most important are in township 40, range 14. Here there is at least one in operation the year round. They supply the surrounding country with cheap fuel.

In general this group is a grain-growing district. It is well settled and on the whole quite prosperous. Stock-raising, except the raising of hogs, is not taken up, except as a secondary consideration. Wheat and oats are the important crops.

The third group comprises all those townships adjoining the Lacombe branch of the Canadian Pacific railway from ranges 14 to 17 inclusive, together with tp. 39-19-4.

The surface of this area is gently rolling prairie with scattered bluffs of poplar and with some low-lying land. Townships 37 and 38, range 14, are broken to some extent by the valley of Castor creek. Townships 38 in ranges 16 and 17 are also slightly broken up by the valley of Bigknife creek. Apart from these two valleys the country is gently rolling prairie.



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Redwillow creek flows northwesterly through tp. 39-19-4, but the banks are indefinite, and as a result the surrounding country is liable to overflow during flood seasons. Excellent grazing and hay lands lie along this stream.

The soil is a heavy clay loam, and is not well suited to the growing of wheat, as the harvesting is so prolonged that frost is liable to injure the grain. Oats is the principal grain grown in this district. Barley is also grown to a considerable extent and is used as feed for hogs, the raising of which is an important industry. Dairying is carried on extensively, the products being shipped by rail to the Edmonton market. Several people in this district have been extensively engaged in horse raising, and from all accounts they appear to be making a success of it.

The roads in this district are in a fair condition and considerable grading has been done.

Lanes lake is the only body of water of any size in this district. This lake has dried up considerably since the original survey, especially at the ends. The bed consists of about two feet of black loam, and when worked it will produce an excellent crop. Some parts of it are now under cultivation.

Several small lakes and sloughs are scattered throughout this district, affording water for stock. In cases where sloughs have become dry they produce excellent hay. Water for domestic purposes is easily obtained at a depth of about thirty feet.

In general this group is a mixed farming country. It is well settled and quite prosperous.

Besides these three groups, a number of scattered townships lying to the south and east were investigated. Most of them suffered severely from the extreme heat and drought of the season and crops were very light.

During the season I retraced 204 miles of line and re-established the same number of monuments. The total number of monuments investigated by me exceeded 2,500.

I closed field operations on October 15.



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## APPENDIX No. 52.

## ABSTRACT OF THE REPORT OF B. H. SEGRE, D.L.S.

## STADIA SURVEYS IN THE VICINITY OF MOOSEJAW.

The area covered by my investigations during the past season may, for convenience of description, be divided into four groups.

The first group comprises townships 18 to 20 inclusive, between the east boundary of ranges 23, west of the Second meridian and Buffalo Pound lake.

The surface of this district consists of rolling prairie, which becomes rougher and more broken as the valley of Buffalo Pound lake is approached. The soil for the most part consists of a good loam, more or less freely intermixed with granite boulders. All those townships north of the valley of Qu'Appelle river are capable of producing excellent crops, but the district is not well settled for the reasons that the lands near the railway are held by speculators, and that the farmers near the lake, owing to the long hauls over the poor roads, do not find grain growing to be very remunerative, and hence go in for a larger amount of stock raising.

An adequate supply of good water is obtained by the farmers of this district at depths varying from six to twenty feet, which is quite an asset. With a railroad nearer Buffalo Pound lake or an improvement of the roads this district should soon become thickly populated.

There has been very little grading done in this district, especially away from the railroads. Many hillocks need cutting down and many low places need filling, and until these improvements are made, farmers who are far away from the railroad towns find their transportation problem a serious one. There are a few crossings on Qu'Appelle river which are bridged, but the grades leading to them are in many instances excessive.

Telephones are rather scarce in this district, but during the summer a few new lines were being erected which should prove of great value to the settlers.

The southern part of the district is cut up by Qu'Appelle valley, which is about a mile wide and from 250 to 300 feet deep. The northern slopes of this valley consist chiefly of prairie with a few shrubs in the coulées, but the southern slopes are covered by a growth of poplar, ash, and willow; the flats adjoining the banks of the river provide excellent pasture for stock, and in some places are being used for growing grain. The light snowfall in this locality, along with the shelter provided by the wooded slopes of the valley, make ranching attractive. The light snowfall of the previous winter and the dry summer has lowered Buffalo Pound lake about two feet, and at the same time has affected the flow of both Moosejaw creek and Qu'Appelle river. Numerous sloughs in these townships are dried up, and were this year producing hay, a fact which was greatly appreciated by the farmers, owing to the failure of the oat crop in this district.

The second group comprises townships 17 to 20 inclusive, and between the first group and the Third meridian.

The surface of this district varies from gently undulating prairie on the eastern boundary to gently rolling prairie on the western boundary, while the southern boundary is cut up by the valley of Thunder creek, which is a tributary of Moosejaw creek. The soil is a light sandy loam in the eastern portion, becoming a little heavier in townships 19 and 20, ranges 28 and 29. The soil along the slopes of Thunder creek is sandy, but gets a little heavier to the south of the valley, with the surface becoming very much broken up.



All the lands in this block are used for grain-growing purposes, except along the slopes of Thunder creek valley, where the farming operations are confined to stock raising only. A good growth of grass thrives along these slopes and the river flats, while the shrubs and poplar bluffs provide the necessary shelter from cold and wet. The water supply, however, is uncertain, as at the time of investigation the creek was dry in places, and the stock were becoming dependent on the supply from wells.

The country north of the valley produces excellent crops, but the farmers have great difficulty in procuring an adequate supply of water. A few wells 200 feet in depth have been sunk, and an abundant supply has been obtained, but the water is generally of an inferior quality. This shortage of water is keenly felt by the smaller farmers who cannot afford the expense of sinking deep wells, and consequently have to spend a great deal of their time in carrying water from the many Government ponds scattered throughout the district.

This district is well supplied with railway facilities as the main line of the Canadian Pacific runs along the southern boundary, and two branch lines of the Canadian Pacific and the Grand Trunk Pacific run northwesterly through the district. A daily passenger and freight service is maintained by the Canadian Pacific, whereas on the Grand Trunk Pacific the service is confined largely to freight, owing to the line being completed only a short time ago. This new line supplies a long felt need to many farmers who found the haul to the Canadian Pacific very long.

The roads in this district are nearly all graded, and generally are in very good condition. In places where the soil is light, however, the wind drifts it over the roads, making them very heavy for traffic, especially after rainfall.

This district is well supplied with telephone facilities, nearly every farmer having a telephone in his house, and extensions are being carried on every year.

The towns along the railroads in this district are all small, except Moosejaw, which extends into township 17, range 26. This city is a thriving divisional point, being served by three railways, with many branch lines running out of it. There are many industries in this city, the largest being the Robin Hood flour mills, which employs a large staff. The city has lately completed its new water-works system, which has proved the solution of a vexatious problem.

The supply is obtained by placing filtration galleries along Sandy creek in township 17, range 29, and then conducting the water by a pipe line a distance of twenty miles to the city.

This district is undergoing a great change in its water areas; all small sloughs are completely dry, and their beds are being used as pasture land. Pelican lake, which lies in the valley of Thunder creek, is completely dry, and now constitutes the largest dry lake bed in this district. Another lake which formerly covered about 200 acres in tp. 18-28-2 has dried up, and the bed is being used for grazing purposes. All that portion of Thunder creek lying to the north of Pelican lake is now dry, but below Pelican lake water lies in pools along the course of the creek. Sandy creek, the tributary of Thunder creek, which is the source of supply for the city of Moosejaw, has many springs along its course, and hence always contains water. There is a small lake in tp. 17-29-2 which was traversed; this lake is evidently permanent as the Canadian Pacific Railway company formerly had a water tank and pumping station on it.

The third group consists of townships 17, 18, 19 and 20, range 1, townships 19, ranges 4 and 7, and townships 20, ranges 2, 3, 4, 5 and 7, all west of the Third meridian.

The surface in this district consists of gently rolling prairie in range 1, becoming rougher as one travels west, finally becoming very rough and hilly around townships 19 and 20, range 7, where the Vermilion hills occur. The surface of the country adjoining the valley of Thunder creek is also very rough, the valley itself being about



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150 feet deep in some places, with slopes nearly perpendicular, thus making good road crossing very hard to find.

The soil of this district varies from a light loam on the east side, to a good loam on the west. This loam is always found to be freely intermixed with granite boulders; these boulders became larger and more numerous immediately adjoining the valley of Thunder creek.

This district is well settled but owing to two consecutive dry seasons, there was almost a complete failure of crops this year. This seeming disadvantage can be overcome in any normal year, as the soil is very fertile and easily worked. Settlement is not very thick in tp. 20-7-3 owing to the hilly nature of the country, numerous deep ravines with precipitous sides being found. These hills would make an ideal place for ranching, if the problem of water supply could be overcome. Here, as in the district to the east, the farmers find some difficulty in obtaining a sufficient supply for all their needs from the shallow wells they are able to dig. There is no doubt however that the past season was a most severe test on wells owing to the dry weather lasting for two years. In ordinary years the settlers of this district should have no difficulty with their water supply.

The coming into this district of the branch line of the Grand Trunk Pacific railway has supplied a long felt want, effecting a great saving to the farmers who hitherto have had to haul their grain about twenty-five miles to the Outlook branch of the Canadian Pacific railway. Many little towns are springing up along this line, but as yet no industries have been undertaken in any of them.

The roads in this district are mostly graded, but in a few cases they are in poor shape; especially is this true in tp. 20-7-3, where the road allowances offer very poor routes for travelling. The old trails are being fenced as quickly as the district becomes settled, causing a great deal of inconvenience to those farmers who have been in the habit of using them. A good crossing of the valley of Thunder creek is badly needed for those people who live on the south side of the valley in township 19, range 4, and west of it.

Telephone communication is very poor in this district due no doubt to the fact that it has been lately settled; however, the nearer the farmers are to the railroads, the better the telephone facilities.

All small sloughs in this district are now dry and produce hay, especially in the case of tp. 20-7-3. This township contains a large number of sloughs, which are now completely dry. This fact has been made good use of by the settlers, who have put up an abundant supply of hay, thus partially offsetting the failure of their oat crop, and rendering the problem of feed for their stock a little easier. The valley of Thunder creek runs through this district; the creek itself was dry, and many lakes lying in the valley have dried up. The largest noted being a lake in tp. 19-4-3.

The fourth group comprises a block of townships lying immediately north of the third group.

The surface in this district is cut up on the west by the valley of South Saskatchewan river; the valley at this point is about 300 feet deep, and over a mile wide. Above the valley the surface varies from gently undulating prairie to gently rolling prairie, until range 3 is reached, after which the country becomes rougher especially to the north, until the sand-hills which adjoin the valley of Qu'Appelle river are reached. Here the surface becomes very rough and cut up by many deep ravines.

The soil on the slopes of South Saskatchewan river becomes lighter as one approaches the shores, and in tp. 22-7-3 there are a number of bare sand-hills with no trace of vegetation growing on them. Above the valley, the soil consists of a good loam which produces excellent crops in ordinary years, but the effects of two abnormally dry years were felt in the shrinkage of the crop yield.



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Along the banks of the South Saskatchewan there is a good growth of poplar and willow, and in secs. 29 and 32, tp. 22-7-3 the poplar reaches nearly thirty-six inches in circumference, however, these large trees are being cut for fuel, and will disappear in time. Above the valley the surface consists of prairie until the valley of Qu'Appelle river is reached where poplar and willow are again found. The sand-hills north of the Qu'Appelle have been placed in the Elbow Forest reserve and are covered by a dense growth of willow and poplar.

This district is very thickly settled from the eastern to the western boundaries, and as one approaches the Outlook branch of the Canadian Pacific railway the improvement in the buildings of the farmers is very noticeable and indicates the prosperity of previous years. All the lands are used for grain growing, and have produced good crops until this year, when the yield has fallen.

The railroad facilities of this district are very good, two branch lines of the Canadian Pacific and Grand Trunk Pacific railways serving the territory. To the north along the valley of the Qu'Appelle there is a location line of the Canadian Northern railway; this line when constructed will be of great benefit to the settlers on the north side of the valley, by saving them the extra haul across the valley to the Canadian Pacific.

The roads in this district are for the most part graded, and a little improvement is being undertaken every year tending to produce good roads a few years hence. There is a fair trail down a ravine in tp. 22-7-3 leading to a ferry across the river; this trail can be greatly improved by the building of a grade and proper draining of the road bed. The grade across the Qu'Appelle valley in tp. 23-2-3 was travelled over after a heavy rain, and was found to be in very poor condition; this could be easily remedied by the use of some gravel an abundant supply of which can be obtained along the slopes of the valley.

Telephone facilities are on the whole very good in this district and additions are being made every season tending to the betterment of the service.

The drying up of sloughs is very evident in this district; all small sloughs were found to be completely dry, and were being used for hay purposes. One lake of fair size was traversed in tp. 22-3-3; this lake at the time of traversing had its bed covered by a coat of white alkaline mud too soft to bear the weight of a man; however, after a rainy period the whole bed became covered by water. There is no vegetation on the bed of this lake, and the land is quite useless for farming purposes.

The lake in tp. 22-7-3 was found to be dry at the time of investigation; the bed of this lake was covered by a thick growth of marsh grass around the shores and by a thick growth of reeds in the centre; there is no doubt that the reedy portion of the bed will be covered by water in wet years, as it is the natural basin for receiving the drainage of a large area.

Ridge creek, which is a tributary of the Qu'Appelle, drains a large area in this district; no water was found along its course until the valley of the Qu'Appelle was approached. Qu'Appelle river was found to contain water, but was very much lower than usual.

After completing the investigation of this district, I left on October 12 to investigate tp. 28-1-3, for which I had special instructions. Silver lake in this township was found to be dry, and in spite of recent heavy rains the former bed was able to bear the weight of a man; hence it is very likely that it will remain permanently dry.

I closed operations in the field on October 15.



## APPENDIX No. 53.

## ABSTRACT OF THE REPORT OF F. V. SEIBERT, D.L.S.

## SURVEY OF THE 26TH BASE LINE BETWEEN THE FOURTH AND FIFTH MERIDIANS.

When making plans for the survey of the 26th base line, I decided to commence at its intersection with the Fourth meridian. The route which I proposed to follow to reach this point was by scows down Athabaska river to the vicinity of the base line and from there overland to our destination. Accordingly, on May 1 I left Athabaska with my party and outfit on four scows, arriving at McMurray on the 13th. At this point we were met by the pack ponies which had been sent down the river on the ice. The ponies were loaded on the scows and after experiencing considerable difficulty at the various rapids on account of low water, we reached the mouth of Redelay creek in the vicinity of the line on May 16.

A cache was built on the west bank of the river at this point. In it were placed the supplies for use on the line west of the river, while the supplies for use east of the river were cached on an old dead channel of Firebag river. The supplies for the western end of the line had been cached in March at the intersection of the 25th base line with the Fifth meridian.

On May 20 we commenced cutting trail to the Fourth meridian. This trail was kept as close as possible to the latitude of the line, so that it could be used when making the survey. The Fourth meridian was reached on June 4, and the production of the line was begun the following day.

East of the Athabaska we encountered no unusual difficulties in running the line. As the trail had already been cut the whole party worked on the production of the line, and good progress was made, the river being reached on June 9. Feed for the horses was somewhat scarce on this part of the line, but sufficient was secured.

West of the Athabaska our transportation difficulties began. Ninety-six miles of line lay west of the river, and our next cache was situated twenty-four miles south of the end of the line. We were therefore 120 miles from our next source of supply. This part of the line crossed many large swamps and muskegs, and to add to our difficulties a number of horses had died of swamp fever when working east of the river, while a number of others were suffering from this disease at the time when the transport was heaviest. The most swampy part of the line was from Athabaska river, in range 9, to the foot of Birch mountains, in range 11. The best horse feed found was on the eastern slope of these mountains. From there on the grass was scarce, and the horses suffered accordingly, but we found many good stretches of trail from range 12 to range 16, and were able to make good progress. We found some good horse feed along Birch and Louise rivers in ranges 19 and 20, and were able to rest the horses while we rafted our supplies on Birch river from the middle of range 19 to the middle of range 21.

Snow fell on September 14 and for nine days following was continually on the ground. This left the horse feed in poor condition, and we were forced to do some man-packing in the last few ranges.

We reached the Fifth meridian on October 7. I then took four men south to the cache on the 25th base line and man-packed enough supplies north to enable us to cut a trail and get our camp moved to the cache. We left the cache on October 17, and followed the old trail from Burnt lakes to Chipewyan lake and across the portage to



Wabiskaw river. From there we followed the trail along the east side of Wabiskaw river and lake to Wabiskaw settlement, and thence to Sawridge, where we arrived on November 11.

The country east of Athabaska river for twelve miles on either side of the base line is of little agricultural value, being mostly sand ridges and muskeg. This area is best suited for a forest reserve. There is very little timber of commercial value on it now, but this is because of forest fires.

The valley of the Athabaska which crosses the base line in range 9 averages a mile in width, and the river one-half mile. The depth of the river varies with the season, but is always sufficient for good steamboat navigation. Some good spruce grows along the banks, and the river flats are the best of land. Firebag river enters the Athabaska about a mile below the line. The north branch of this river crossed the line four times. It is navigable for canoes throughout almost its whole length.

From Athabaska river to the foot of Birch mountains, the soil, though wet, would make good farm land. It is composed largely of clay deposits from the hills to the west. It could be easily drained, and the water on it now is principally the result of beaver dams. There is some good poplar, spruce and jack pine in this area. The east slope of Birch mountains in ranges 11 and 12 has good soil, but is very steep in places. The timber here is good, there being much large spruce and poplar, also much white birch from which the hills no doubt derive their name. These mountains appear to be mostly glacial deposits. A few small limestone and sandstone ledges were noted on the eastern slope, but most of the cuts, and there are many, show boulder clay. From the summit in range 12 to the fifth meridian the country is almost entirely covered with moss. Underlying the moss in ranges 13, 14, 15 and 16 is a mass of boulders imbedded in clay. In that district are many lakes and shallow muskegs. In range 14 there are some large lakes which are drained by Marguerite river; this river is very probably the headwaters of Moose river. From range 15 west the high land has fewer boulders and more clay, but most of the muskegs are deeper and they are more numerous. The headwaters of Louise river start in the west side of range 14, and the line follows the drainage of this river and Birch river very closely to range 21 where Birch river swings to the northwest. In range 18 Louise river joins Birch river, which comes from the south beyond the correction line. These rivers have large areas of muskeg on either side, but back from the river at distances of from three to eight miles are hills of clay land with some boulders. These hills all have a growth of poplar, spruce and some jack pine, but here again the fires have kept the timber growth small. In range 23, the height of land between Athabaska and Peace rivers is crossed. From there the country slopes westerly along Mikkwa river valley.

Moose and caribou were very scarce all along the line, but fur-bearing animals were plentiful. The most common were beaver, fox, mink, marten, black bears, timber wolves and muskrats. Birch river was very noticeable for its many mink.

Aside from the tar sands on Athabaska and Firebag rivers no minerals were noted.

Whitefish were seen in Athabaska river and jackfish in all the large lakes and streams.



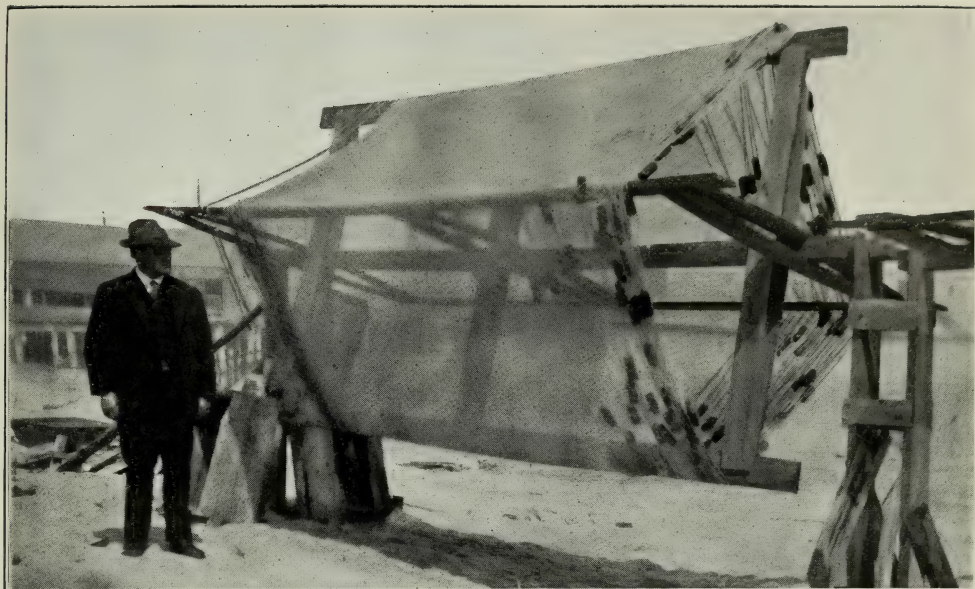


Photo by A. M. NARRAWAY, D.L.S.

#### DRYING WHITEFISH NET, LITTLE GEORGE ISLAND—LAKE WINNIPEG.

By law all nets must be taken from the water over Sunday. They are brought to the fishing station in wooden trays, one of which is shown in the lower left corner, and wound slowly on reels to disentangle the floats and leads. Each fisherman has a reel, and the inspector of fisheries can tell at a glance if the law is being observed.



Photo by R. B. McKAY, D.L.S.

#### GARDEN, OF EXPERIMENTAL FARM—FORT VERMILION.

The grain and vegetables grown and ripened on this farm indicate the agricultural possibilities of the vast stretch of level country lying north and west of Fort Vermilion. The area of good agricultural land in this vicinity is estimated at over 3,000 square miles.







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## APPENDIX No. 54.

## ABSTRACT OF THE REPORT OF H. M. R. SOARS, D.L.S.

## STADIA SURVEYS IN NORTHERN ALBERTA.

My stadia surveys of the past season were begun in tp. 52-23-4, and from there I worked easterly through ranges 22 and 21.

Owing to the proximity of the city of Edmonton many of the homesteads in these townships are held by speculators, and are still in an uncultivated state. The surface, generally, is rolling, and in many places poplar and willow grow in clumps. The land is not cultivated to any great extent except in tp. 52-23-4, but dairying is carried on and a great deal of milk is shipped to Edmonton daily.

After finishing this work we moved by scow across Cooking lake to the southern part of tp. 51-21-4, where we struck the road from Edmonton to Tofield. The old trail has been abandoned, but the road allowances are so improved that there is now an excellent motor road to Tofield.

The water of Cooking lake is not good. It appears to come from springs in the centre and from the creek connecting it with Halfmoon lake. The depth averages from seven to eighteen feet, the deepest part being in the narrows, in section 35, tp. 51-21-4 and the shallowest in the bays. Very few of the settlers around this lake do much farming; they grow only sufficient grain and vegetables to meet their own wants. The locality seems especially adapted for the raising of potatoes, those obtained being of exceptionally fine quality. On the whole the district is admirably suited for mixed farming, the grazing being luxuriant, water plentiful and the market close and easy of access.

From township 51, range 21, work was carried on in an easterly direction through townships 51, ranges 20, 19 and 18, camp being moved along the Tofield trail. That portion of tp. 51-20-4 lying south of Hastings lake is very hilly, the main trail along the south cross line presenting a series of abrupt hills, but the road improvement has been so well carried out that the trail is quite suitable for the hauling of heavy loads. This township, though well adapted for mixed farming, has not been cultivated to any extent. Some very fine potato crops were noticed on the side-hills.

On reaching the vicinity of Beaverhill lake some very fine farms were seen. A very large amount of hay is annually cut along the west side of the lake. The stock in this vicinity was in splendid condition and the crops were heavy. There is a soft lignite mine in operation just south of Tofield.

To the west of the lake lie the Beaver hills, rising to a height of probably 250 or 300 feet. Cooking Lake Forest reserve covers about three townships in these hills. Unfortunately they have been burnt over on several occasions and a large amount of good timber has been destroyed.

That portion of tp. 52-19-4 lying east of the reserve, and all of tp. 53-19-4 were investigated. No great amount of cultivation has been carried out through these townships, the surface of the former being very broken and covered with dense brush in many places, but both townships have been patented practically throughout.

In tps. 53 and 54-18-4 the country becomes more level and is fairly well cultivated.

The little market town of Chipman on the Canadian Northern railway in sec. 30, tp. 54-18-4 is the centre of a rich farming district and prosperity, the result of good crops and energetic farming, is most noticeable. Several carloads of stock, including sheep, cattle and hogs are shipped weekly into Edmonton.

The country on the east side of Beaverhills lake is wooded with scattered bluffs of small poplar and willow. A good percentage is under cultivation. Mundare on the Canadian Northern railway, the market town for this district, shares in the prosperity so marked through this locality.



Beaverhills lake, which is superficially one of the largest water areas in this part of Alberta, would appear to be an overflow from the creeks that run in from the west and south and not a natural lake bed. It is very shallow, many sand-bars appearing in the centre. The average depth for a distance of ten chains or more from the shore appears to be from three to five and one-half feet. Seven feet was the deepest sounding taken. The lake is weedy. It would appear that the flooding of the surrounding meadows, which sometimes occurs, is caused more by a strong wind prevailing from the same quarter for some length of time than by excessive rainfall. The fact that this flooding occurs more in the south and southeastern parts of the lake would bear this out, as the prevailing wind in northern Alberta is from the northwest.

To summarize on the district investigated it may be stated that, with the exception of some rough land adjacent to Cooking Lake Forest reserve, the country is well adapted to any form of farming, though mixed farming would appear to be the most suitable. Truck farming in the Edmonton neighbourhood should prove a very paying venture, as early frosts do not seem to be prevalent through this district.

The country north of township 35 up to Lac la Biche and west from range 7 to the Fifth meridian appears to have had a heavy rainfall this year, but not sufficient to damage the crops. This block of land comprises the very choicest farming country in Alberta. The climate is equable and the water plentiful and good. There is sufficient timber for local use and sufficient bluffs for cattle wind-breaks. An abundance of upland and slough grass can be cut, and in many places the pea-vine is most luxuriant. East and south of this district the greater portion of the country suffered this year from drought.

On October 6 I left my assistant to complete the work in this district and to move the outfit to Edmonton, while I, accompanied by one man, left for tp. 60-12-4 to resurvey a portion of Garner lake. The trail taken lay through a district in which the majority of settlers are Russians, who appear to be very prosperous. The old Victoria trail has been abandoned and the road allowances are travelled. The country is uniformly good through Andrew in tp. 56-16-4 and on to Saddle Lake Indian reserve. On the north side of the Saskatchewan is a stretch of exceptionally fine country, but the Indian reserve covers about 140 square miles of the choicest. The townships to the north and east of Saddle lake have been well settled during the past five or six years by a very good class of settlers, principally English, French, American and Canadian.

This fertile district is only awaiting the railway facilities to be opened up by the completion of the Canadian Northern railway from North Battleford to Edmonton to become one of the most prosperous and desirable localities in Alberta. The surface is generally rolling, and is well timbered, but it can be easily cleared, where necessary. Upland grass, pea-vine and slough grass is plentiful throughout. Water is abundant and good, and many of the lakes contain whitefish, pike, pickerel and perch. It is essentially a mixed farming country.

Between these townships and Downing on the Edmonton-Victoria trail, there is a stretch of about eight miles of rather rough country covered with dense poplar. A few Russians, some of whom seem to have a preference for thickly wooded homesteads, have settled there, and are gradually developing the country.

Around Wahstao, in ranges 15 and 16 is a thriving colony of Bukowinians, who located there in 1902 and 1903. They are now in a very prosperous condition, and it is evident that Bukowina furnishes some of the most desirable mid-eastern European immigrants.

From Victoria on to Edmonton the trail runs through a uniformly good mixed-farming country.

Edmonton was reached on October 15 and the party paid off.

The work throughout the season was delayed both by the many heavy rain storms and by the thick bush which surrounded the lakes.



## APPENDIX No. 55.

## ABSTRACT OF THE REPORT OF N. C. STEWART, D.L.S.

## SURVEYS IN THE REVELSTOKE DISTRICT, BRITISH COLUMBIA.

My work for the past season consisted of the survey of lands along Columbia river, south of Golden.

I began in tp. 27-22-5 where I traversed parts of Columbia and Kicking Horse rivers together with the islands. Most of these islands are likely to be flooded at high water and are therefore of doubtful value.

On May 8, I moved by canoe up Columbia river to tp. 26-21-5. Sufficient lines were run to survey a bench of land which lies in sections 31, 32 and 29. This bench is from 300 to 500 feet above the Columbia and about a half mile in width.

From the same camp surveys were made on the west side of the river in secs. 25 and 36, tp. 26-22-5. This is a low wet area composed of marshes, sloughs, mud flats, and hay meadows.

On May 30 I moved to sec. 23, tp. 25-21-5. The bench land southwest of the river in the vicinity of this camp is narrower and more broken up by creeks, but it is a continuation of the bench land in the townships to the north. Nearly a week was spent in traversing Columbia river near this camp.

My next camp was at Carbonate Landing in sec. 8, tp. 25-20-5. The land on the benches southwest of Columbia river in this township is better than that to the north-west and the benches are larger and more numerous. Some good timber consisting of fir, spruce, jackpine and cedar, averaging about eight to ten thousand feet B.M. to the acre was found in the west half of section 5.

A pack-trail to Spillimacheen river starts at Carbonate landing. It was made many years ago during a mining boom up the Spillimacheen and now needs clearing out as it has been kept open by hunters and trappers only.

Surveys were also made on the bench land northeast of Columbia river in tp. 25-20-5. A good road giving access to this land has been built during the past two years. It joins the main road near Mallet station on the Kootenay Central railroad. Practically all quarter-sections on this bench land have been filed on. The cultivated areas at present are not very extensive, but good crops of vegetables, small fruits, and clover have been raised.

On July 25 I moved to Ore Pile landing in sec. 17, tp. 24-19-5. Specimens of the galena ore which were taken from the Spillimacheen over an old sleigh road are still to be found there, although the road itself is hardly traceable. From this camp surveys were made on the bench land west of the Columbia in townships 24, ranges 19 and 20. The bench land widens out in these townships, and there is a low divide between Columbia and Spillimacheen rivers. The soil is about the same as in the townships to the north. Nearly all the large timber has been burnt off and a dense second growth has grown up. The few creeks in the neighbourhood are small and some of them dry up in the summer. The bench land ends near the S. by. sec. 36, tp. 23-19-5, and from there to the south boundary of the railway belt the steep slopes of Jubilee mountain reach almost to the banks of Columbia river. Before leaving these townships we made a complete stadia traverse of the river and of the marshy lakes which appeared to be permanent.



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In tp. 23-18-5 I surveyed the N. and E. bys. of sec. 32 and sufficient lines to complete the survey of the low valley lands on the southwest side of the Columbia river. I also made a stadia traverse of the river and the marshy lakes.

From October 14 to October 30 I completed the traverse of Columbia river from the S. by. tp. 25-20-5 to the town of Golden. All the marshy lakes in this area were also traversed.

Every quarter-section of any value for agricultural purposes along the northeast side of the Columbia between Golden and the south limit of the railway belt has been filed upon. The settlers as a rule have come into the valley without means and consequently the amount of land cleared is small. Very few settlers have located on the southwest side of the river, owing chiefly to the difficulties of transportation across the river.

During the summer a party of engineers were engaged making a survey of the lowlands along the river between Golden and the belt limit. This I believe is the preliminary work of a company which has been formed to drain this area. Should this company be successful in their undertaking 16,000 acres of the finest land in the province will be open for settlement.

Game is very plentiful in the valley. In the fall ducks and geese are found in the sloughs in large numbers. Mountain goats can be seen on the Beaverfoot mountains any clear day and the Spillimacheen valley is famous for grizzly bears.



## APPENDIX No. 56.

## ABSTRACT OF THE REPORT OF P. B. STREET, D.L.S.

## SUBDIVISION SURVEYS IN NORTHERN MANITOBA.

I left Pas, where my party was organized, on September 28 and travelled by way of the Hudson Bay railway to tp. 69-7-Pr., where I arrived the following day.

Our work for the winter consisted of the subdivision of part of this township and other townships adjoining it to the northeast, along the railway right of way.

Our main supply camps were located close to the railway while the work was carried on from flying camps which were kept close to the lines being run. On some parts of the work the country was so strewn with windfall that we could not clear trails for the dog teams without wasting too much time, so we man-packed the supplies from the main camp. During the month of December two packers were kept busy every day, to keep the camp supplied.

In the first week of November we had a fall of fifteen inches of snow, and the weather turned cold; the muskegs, however, remained open till January. By that time the snow was two feet deep and travelling across country was very slow, especially where there was much windfall. All the creeks had frozen to the bottom and it was necessary to melt snow for our water supply. For this purpose it was necessary to keep one man in camp all the time. During the last week of January we had the only extremely cold snap of the winter; the thermometer registered from  $-40^{\circ}$  to  $-50^{\circ}$  on several occasions.

I closed operations on March 17, and returned by train to Pas.

The country covered by our surveys is mostly rolling, and is well drained by numerous small creeks. The surface is practically all densely wooded with poplar, spruce, jackpine, birch and tamarack. The timber, however, is not large enough to be of commercial value.

The southern part of this district borders on Sipiwesk lake. The country around the lake is rolling and somewhat rocky. This lake seems to have innumerable narrow bays which run inland for several miles. Its shape is the most irregular of any body of water I have ever seen, and a stranger attempting to cross it in summer might easily become lost for a week before he could locate the main outlet. It appears to be shallow and in winter a great deal of fishing for sturgeon is done on it.

Moose seemed to be plentiful north of this lake and numerous foxes and timber wolves were seen.



## APPENDIX No. 57.

## ABSTRACT OF THE REPORT OF A. G. STUART, D.L.S.

## BASE LINE RETRACEMENT AND MISCELLANEOUS RESURVEYS IN MANITOBA AND SASKATCHEWAN.

The first work undertaken was the retracement for bearings of some townships bordering on lake Manitoba, part on the north shore west of Gypsumville, and part on the west shore near Ebb and Flow lake. This was completed early in May. During this retracement we re-ran about 400 miles of line.

While carrying on the above work the snow was very deep, having drifted in among the scrub and timber to a great depth. During the warm spring days it melted so rapidly that a pair of snowshoes in the west lasted only a few days. At night a thin crust formed, which made it very inconvenient to move rapidly and during the latter part of the work we were continually wading in a foot or two of ice water as the lands immediately surrounding the lake are somewhat low and swampy.

No doubt at some future date lake Manitoba will be lowered by the dredging of the river channel linking the two lakes. This will drain large tracts of land bordering the lake, making it more fitted for agricultural pursuits.

It is also probable that at some future date the rivers joining these two immense inland seas will be made navigable and thus the future settlers of lake Manitoba will have a waterway to Winnipeg, the metropolis of the West. These lands would then be almost ideal for homesteads as the soil is rich and there is an abundance of wild hay, building material, wood, game, and whitefish.

Upon the completion of this retracement I organized a larger party to retrace the 2nd base line between the Second and Fourth meridians, and also the Fourth meridian from the international boundary northerly over sixty-one townships. These surveys were necessary in order to check the accuracy of the original work.

Lines of levels and check levels were carried over the outlines retraced, elevations being established in the towns in the vicinity of the work, and connections made with several other lines of levels, including railway, irrigation, and precise levels of previous surveys. These levels were reduced to mean sea-level datum and added to the network of levels already taken over the western provinces, which will some day be of immense value in the development of the country.

There is little doubt that in future years these provinces will need and be supplied with hydro-electric power on an even greater scale than it is being developed at present in the province of Ontario; at such a time the levels will be very useful. Large sums of money are being spent yearly on graded roads and with the ever-increasing usefulness and popularity of power vehicles has come a demand for national highways such as is at present being felt in the Western States, and the system of levels taken in connection with Dominion lands will again prove its usefulness, while in many places in the northern part of the provinces drainage problems on a large scale will be made easier.

Sixty-nine miles of the base lines closing on the meridian were retraced for bearing.

In the Wood mountains and Cypress hills, which were crossed by our surveys, there is an abundance of wooded country supplying the settlers in the surrounding prairie with building material and fuel. In the latter place there is a national



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forest reserve where restrictions are enforced for the preservation of growing timber. Homesteaders come to this place during the winter months for a distance of sixty miles in order to obtain fire-wood.

In southern Saskatchewan soft coal was obtained from local mines in many instances. In this district ranching on large tracts of leased land is carried on extensively. The country appears to be much more suitable for this purpose than for farming on a small scale.

During the season, besides the retracement around lake Manitoba, 750 miles of outline were retraced, 60 magnetic observations were made and about 325 azimuth observations were taken and computed.



## APPENDIX No. 58.

## ABSTRACT OF THE REPORT OF C. H. TAGGART, D.L.S.

## SURVEYS IN KAMLOOPS DISTRICT, BRITISH COLUMBIA.

The principal work on which I was engaged during the season was the delimitation of the north boundary of the railway belt westerly from North Thompson river. A few other small surveys were also made before this work was commenced.

In tp. 22-16-6 we traversed a portion of Heffley creek. To reach this work we travelled north along North Thompson river, then east along Heffley creek. The city of Kamloops has a transmission line along the river to their power-house on Barrier creek, about forty miles north. The available head of water there is about one hundred and eighty feet and the available horse-power is said to be 20,000.

The transmission line crosses large areas of valuable land which need only irrigation to make them productive. It is now possible that nearly all of this land can be brought under cultivation by using this electrical power to pump water from the river, provided that the rates are not prohibitive.

Having finished the work in township 22, range 16, on April 24, we moved back to Kamloops, and then following the wagon road easterly along the north side of South Thompson river, we reached tp. 20-14-6, where we were engaged until April 28 running section lines.

In this township, on the bench lands above South Thompson river, many settlers have located, and are trying to raise crops with the dry farming method, but with what success it is rather difficult to say, as only a small area has as yet been cultivated.

On April 29, we again moved to Kamloops, and on the following day left for tp. 23-17-6, by way of the wagon road along the west side of North Thompson river.

The first thing of note after crossing Thompson river west of Kamloops, and passing through North Kamloops, is the new townsite recently laid out along the Canadian Northern railway. Just to the east of this townsite the railway crosses the North Thompson on a fine steel bridge of the lift-span type, which I understood is the first of its kind in Canada. Station grounds have been laid out just west of and adjacent to the wagon road. It is in this vicinity that it is expected the new railway shops are to be erected.

All the bottom lands along the west side of North Thompson river, with the exception of a few holdings, belong to the British Columbia Fruitlands company, who also have extensive holdings along Thompson river between the North Thompson and the Kamloops lake. A fine up-to-date irrigation system has been constructed to carry water for the irrigation of these lands. The water is taken out of Jamieson creek about three hundred yards west of the wagon road crossing, and conveyed to the lands by concrete-lined canals and underground concrete pipes. The main canal is fifteen or sixteen miles long and follows close to the foot of the hills. Where the main canal passes a large rock slide, an inverted syphon has been constructed, which is at least half a mile in length. The intake and outlet bases are built of reinforced concrete, and the syphon consists of a forty-eight inch continuous wood stave pipe laid underground. A very large amount of money has been spent by this company to construct their irrigation system. The chief crops grown on the lands above mentioned are hay, and some fruit.

The limit of the railway belt after crossing the North Thompson passes over the Jamieson range of hills, which are about 2,500 feet above the river. The fact that our



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camp had to be located along the river, and, that after the first couple of days this climb had to be made before a day's work was begun, made progress slow.

The line was produced westerly until well down the west slope of the range, so as to be easily picked up after establishing a new camp on Jamieson creek.

We decided that it would be very difficult to construct a trail over the Jamieson range, and that it would be simpler and much quicker to go around and use the old trail up Jamieson creek. We therefore moved our outfit to the head of the British Columbia Fruitlands company's irrigation ditch, where we made our cache, and started to rush supplies up to the line, as it was feared that the creek was liable to be soon in flood, which would make transportation difficult. Unfortunately the weather turned very warm and, augmented by two days' heavy rain in the mountains, the freshet water started down from the hills, and before we could make the trail passable for pack trains, Jamieson creek had become a roaring torrent, washing out bridges, and making fords practically impassable.

Jamieson creek flows in a narrow valley and to get up at all with a pack train the stream has to be crossed many times, and in all but one place bridges had to be built. Considerable time was lost from the actual line work by these operations. It was found necessary to pack hay and oats for the horses as the vegetation on the hills was of no value for horse feed.

From the crossing of the north fork of Jamieson creek to the high land in sec. 28, tp. 23-18-6, the belt limit passes over rough broken country mostly wooded with a dense growth of small fir, with much standing and fallen dead timber. Wentworth lake in section 28 has been converted into a storage reservoir for irrigation waters for the lands belonging to the British Columbia Fruitlands company. Alexander lake, about three miles due west from Wentworth lake, is also a reservoir, in which the west fork of Jamieson creek rises.

While working in the neighbourhood of Wentworth lake the weather was very bad, with snow, sleet and cold rains. On June 6, 7 and 21 heavy snowstorms were experienced; in fact while working in this vicinity three to four feet of snow was still on the ground.

We carried the line westward to the NE. corner of sec. 14, tp. 24-20-6, where we connected with that part of the "belt limit" previously run. My next work consisted of the subdivision of all the unsurveyed lands in the vicinity of Criss creek, in township 24, ranges 20 and 21, and a few miles in township 23, range 21.

Criss creek with its many tributaries drains a large area of country. The main creek appears to rise in Tsintsunko and Caribou lakes which are in provincial lands just north of tp. 23-18-6. These lakes could be well utilized as storage reservoirs for irrigation waters. During the spring freshet Criss creek is a large roaring stream, but as soon as the run off is over the stream becomes practically dry in an average season. A water power development of some size might be possible of the Tsintsunko lakes. Between the large lake to the south of the group and the northerly one there is a fall of from ninety to one hundred feet.

The subdivision in this district was completed on August 30, and I then started the production of the northerly limit of the railway belt westerly from the north boundary of sec. 8, tp. 24-21-6.

Deadman river flows in a narrow valley bounded by steep rugged hills with many narrow canyons. The belt limit crosses the north end of Mowich lake which is an expansion of Deadman river. To the northward about a mile is Deadman lake, which is now used as a storage reservoir for irrigation waters, a splendid dam having been built at the south end of the lake. The waters are used on lands belonging to a company operating very extensively at Walhachin.

A little difficulty was experienced in getting a pack-trail up the west side of Deadman valley, but we were fortunate to find a passable route, and finally located



a camp above the river. Between this point and Hihium lake a rolling plateau is crossed, which like most plateaus in this district is about 4,000 feet above sea-level, and well wooded with pine and small fir. Occasional wild hay meadows were seen, but their size is too small to be of any great value.

Cattle and horses in large numbers were seen ranging over this country and for this purpose the country is well adapted. It seems to be best suited for sheep ranging.

Hihium lake in tp. 24-23-6 is a large body of water; its altitude is from 4,500 to 5,000 feet, and its waters abound with fine trout. Ducks and geese were seen there in large numbers, also deer and bears. The outlet of this lake is a creek by the same name, which flows westerly into Loon creek, a tributary of Bonaparte river.

From Cultus Lake post office on Deadman river a pack-trail leads over the hills, and at the summit branches, one branch going north to the north end of Loon lake, which is in provincial lands, and where a small settlement is to be found; the other branch goes westerly to Hihium lake.

From Hihium the belt limit gradually descends to Bonaparte river valley. The country is rough and rugged and well timbered with jackpine, bullpine and fir.

After making ties to the monuments previously established, where the line crosses the Bonaparte, it was produced westerly and tied to the monument establishing the railway belt limit on the Cariboo road, in tp. 23-26-6. Subdivision and retracement surveys were then made in the vicinity of Maiden creek and Bonaparte river, the work being completed on October 26.

Along the old historic Yale and Cariboo wagon road, on which our last camp was located, but very little life was noticed, compared with former days. Only occasional freight teams or automobiles were to be seen. With the opening of the Grand Trunk Pacific railway, freight is now brought into Fort George to supply all the upper country. With the addition of the Pacific and Great Eastern railway, which is being rushed to completion, Fort George and Vancouver will be joined, and this upper country will be well served with railroads which will add much to the development of this vast area.

Large droves of fine beef cattle were seen coming down the Cariboo road which would indicate that the upper country is an excellent cattle country.

I took the party back to Kamloops, paid off the men, and with my assistants went a few miles south of Kamloops to section 4, township 20, range 18 to investigate and make retracement surveys along the Kamloops and Savona wagon road across the Nighthawk mineral claim. This work was completed on October 31.

My last work was a stadia survey of the improvements to be found on the south-east quarter of sec. 12, tp. 18-12-6 which was completed on December 23. The weather conditions throughout the district were fine, but from the farmer's standpoint it was considered very dry. On lands where irrigation was used the crops were very good, but where the dry farming methods were practised, crops suffered from lack of moisture.



## APPENDIX No. 59.

## ABSTRACT OF THE REPORT OF C. M. WALKER, D.L.S.

## SURVEYS IN THE ROCKY MOUNTAINS PARK, ALBERTA.

My first work consisted of a resurvey of those portions of blocks 1 and 2, Banff townsite, which border on Banff avenue. When the correct positions of the lot corners had been determined, holes were drilled through the concrete sidewalk and posts were placed at one foot offset to mark these corners. Cement was tamped around the posts, while they were held in true position, thus ensuring accurate and permanent monuments.

I next proceeded to outfit a party for the resurvey of the townsite of Canmore. Considerable difficulty was experienced in locating any suitable monument as a starting point, though eventually two original iron block corners were discovered at a distance of half a mile from the town. The survey of the townsite was accordingly carried out with these corners as reference posts.

On completion of this resurvey, we continued the traverse with levels of the Calgary-Banff auto road, from the point at which it was stopped in 1913 eastward to the boundary of the park, a distance of about twenty-two miles.

We next moved to Banff and made traverses, with levels, along part of the left bank of Bow river, and of two islands in the river. We then made the necessary surveys to determine contours over the westerly slopes of Tunnel mountain with a view to further extension of the townsite of Banff in that direction.

Our chief work during the season consisted of the survey of an addition to the villa lot section of Banff, including preliminary traverses with levels along the proposed roads and final posting of all lot and block corners by right-angled offsets from the preliminary traverse lines. We also ran preliminary surveys for a road around the eastern side of Tunnel mountain, connecting with Tunnel mountain road as outlined by Mr. Mawson, and also for a branch road connecting with the Calgary-Banff auto road at Anthracite and running direct to lake Minnewanka, a distance of about four miles.

This work in the villa lot section, together with the survey of an additional subdivision in the north end of the townsite, was continued uninterruptedly until September 23, when we moved to Bankhead in order to lay out a cemetery at that place, on a tract of land chosen for the purpose by the Parks Branch.

Upon completion of this work we again moved to Banff and finished the survey of villa lots as far as we had instructions, whereupon the party was disbanded on October 21.



## APPENDIX No. 60.

## REPORT OF J. N. WALLACE, D.L.S.

## LEVELLING IN MANITOBA, SASKATCHEWAN AND ALBERTA.

I have the honour to submit the following report on levelling operations carried out during the year ended March 31, 1915.

The work may be classified into: (1) Levels taken along meridians and base lines during their survey; (2) lines of precise levels which are run, for the most part, along railway lines, and (3) work done in the office at Calgary.

A general report on all levelling operations from their inauguration in the year 1908 to the end of October, 1914, has been prepared during this past season, and is now being printed. It gives an historical and descriptive account of the work, and contains a summary of the results, this summary including the elevations of some 8,900 points spread over the country from southeastern Manitoba to the northwest of Peace River block.

Steady progress has been made in running lines of levels. The mileage run during the past twelve months is as follows:—

	Miles.
Meridian and base line levels. New lines.....	2,309
Precise levels. New lines.....	505
Precise levels. Revised in the field.....	274
Total for the season.....	3,088

The following table shows the mileage of all levels run in each season from their inauguration to the end of this past season, each season being considered as extending to March 31 of the following year:—

Season.	Meridian and base line levels.	Precise levels.	Other levels.
	Miles.	Miles.	Miles.
1905.....	114	.....	.....
1908.....	116	.....	.....
1909.....	613	.....	.....
1910.....	757	.....	.....
1911.....	1,325	.....	116
1912.....	1,433	497	70
1913.....	1,992	567	72
1914.....	2,309	505	.....
Totals.....	8,660	1,569	258

Total of all lines of levels, 10,487 miles.

The mileage stated for precise levels in season 1914 does not include 274 miles revised in the field.



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*Meridian and Base Line Levels.*

These levels are run along meridians and base lines during their original survey. As the lines are surveyed in advance of settlement the levels afford the first information of elevations of the various features of the country. They are carried out with a considerable degree of accuracy, the instructions requiring each mile to be checked within the limit of one-tenth of a foot per mile between the two separate levellings in opposite directions. The instrument used is a fourteen-inch dumpy level, with inverting telescope.

The information recorded includes the elevation of the ground at every quarter mile, and in addition the elevation of the water in all streams, lakes and swamps crossed by the lines. Bench-marks for future reference are established at distances not greater than a mile apart. The mark most commonly used is a spike left in a tree, but marks are left on rocks or firm boulders if such are available. All elevations are referred to mean sea-level.

As already stated, 2,309 miles of levels of this class were run during the past year. It is convenient to deal with these from east to west and from south to north, grouping them in order of the meridians, commencing with the Principal meridian.

In the southern part of Manitoba ninety-eight miles of outline were run near the east shore of lake Winnipeg. The 13th and 14th base lines, which had been run easterly from the Second meridian, were completed to the west shore of that lake, thirty-six miles of these two base lines being run during the past year. A considerable amount of levelling was done in central and northern Manitoba. The Principal meridian was extended from township 80 to township 88, its northerly end being now about thirty miles south of the crossing of Churchill river. To the east of this meridian parts of the 21st, 22nd, 23rd and 24th base lines and of certain connecting meridian outlines have been run and a connection following the vicinity of Nelson river and the Hudson Bay railway has been established and the seaboard reached at Port Nelson.

The datum used to extend the levels into northern Manitoba, and along the Hudson Bay railway to the sea, has been derived from a long connection levelled up from the south. It originates at a bench-mark of the United States Coast and Geodetic Survey established at Stephen, Minnesota, about forty miles south of the international boundary. From there levels were carried northwesterly by the Geodetic Survey over railway lines by way of Emerson and Regina to Warman. From there levels were continued by this branch northerly along the Canadian Northern railway to Prince Albert, easterly to Hudson Bay Junction, northeasterly to Pas, and then 100 miles farther, along Hudson Bay railway, to the intersection of the 17th base line, which forms the north of township 64. Beyond this point the connection follows the 17th base line easterly to the Principal meridian, and then north and east along meridians and base lines to Port Nelson. The total length of this route, from Stephen, Minnesota, to the sea at Hudson Bay, is 1,580 miles. Connection has been made with the tide gauge at Port Nelson, but a comparison with mean sea-level has not yet been worked out.

Owing to deficiencies in the original levels which had been run in previous seasons along the Second meridian from the crossing of Saskatchewan river to township 80, these levels were re-run this season. For the same reason, the levels previously run along the 15th base line west of this meridian are now being revised.

The original survey of the 2nd base line, which was made many years ago, was retraced this season from the Second meridian as far west as the Fourth meridian. Advantage was taken of this survey to run a line of levels along the base line over the prairie, no levels having been run in that district before. The only other line of levels run between the Second and Fourth meridians during the past year consisted of eleven ranges of the 16th base immediately to the west of the Second meridian.



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This base line had been previously run east from the Third meridian and the survey of these ranges completed it between the meridians.

In addition to the levels over the prairie along the 2nd base line, a large mileage of prairie levels was run along the Fourth meridian during its retracement the levels extending from the international boundary to Saskatchewan river in township 53. No levels have been run along this meridian between townships 53 and 60, but north of the latter township, levels have been already carried along the meridian to lake Athabaska in township 115 which is 690 miles north of the international boundary.

In the country near Athabaska river and north of McMurray two surveyors were at work. One of these completed the parts of the 24th and 25th base lines westerly from the river to the Fifth meridian and the other ran the 26th base, from the Fourth meridian to the Fifth. The completion of these base lines has resulted in the levels along the two meridians being now connected to eight different base lines.

The Fifth meridian was not advanced this season. It had already been extended to township 112, a few miles north of where it crosses Peace river, about seventy miles east of Fort Vermilion; two surveyors were engaged on the survey of base lines west of this meridian. The first continued to survey the 26th and 27th base lines easterly to the Fifth meridian, completing the parts between the meridian and range 17 and range 9 respectively. The second surveyor ran the 29th base westerly from the extreme north end of the Fifth meridian to the longitude of the Sixth meridian. The latter meridian has not yet been surveyed north of township 90, so that no closing is as yet available for the westerly end of the levels of the 29th base line. This base line is the most northerly one yet surveyed. It passes about twenty-six miles north of Fort Vermilion settlement on Peace river.

The only levels run last season in the country west of the Sixth meridian comprise a line along that part of the west boundary of Peace River block, which extends from township 81 to township 84. This line afforded a much needed connection to sea-level for several hundreds of miles of levels in the southerly part of this block.

Although many base lines have been wholly or partly run between the Fifth and Sixth meridians, there is only one line of levels, namely, that along the 23rd base line, which extends across the entire distance between the meridians. The result is that there is only this one connection to sea-level for all the levels, amounting to 528 miles, run along the Sixth meridian and the base lines in Peace River block.

#### LINES OF PRECISE LEVELS.

Two level parties were employed in the field, one under Mr. L. O. R. Dozois, D.L.S., from May 13 to October 26, and the other under Mr. J. T. Carthew, D.L.S., from June 11 to August 7, after which date the party was in charge of Mr. E. W. Berry, D.L.S., until January 25, 1915.

One party under Mr. Dozois commenced work at Winnipeg and levelled along the Canadian Northern railway to Swan river, running spur lines of levels from Portage la Prairie to lake Manitoba, from Ochre river to lake Dauphin and from Sifton Junction to lake Winnipegosis. These levels amounted in all to 321 miles. Connections were also made along the line, run the previous season, between Swan River and Hudson Bay Junction. The line of levels from Winnipeg to Edmonton has now been completed. The route followed is all along the Canadian Northern railway by way of Portage la Prairie, Gladstone, Dauphin, Swan river, and Hudson Bay Junction to Prince Albert, then south to Warman and west to Edmonton. The distance from Winnipeg to Edmonton by this route is 958 miles. At Edmonton connection is made to a line from Calgary, making a total length of 1,157 miles of continuous levelling.

In running these levels along railway lines permanent bench-marks have been left at average distances of about five miles apart, at least one being



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left near every railway station, whether the country is settled or not. In many cases two bench-marks have been left near the stations and where questions of transport allowed it, additional bench-marks have been left midway between stations. These bench-marks consist of copper bolts fixed in stone or concrete buildings or bridges, or in special concrete pillars. The elevation of every railway station, and of the water in every stream, is also determined, as well as the elevations of many of the road crossings. These are all taken as intermediate sights, after the elevations of the main line turning points have been recorded at the instrumental stations. They do not, therefore, interfere with the accuracy of the main line of levels.

A great difficulty in running precise levels arises from the liability of making clerical errors in the field record. The method used consists of a continuous summation of the separate rise or fall which occurs in each mile section. No regular rule can be followed in regard to the order in which the duplicate lines are run forward or backward over a section. In fact the order is necessarily not uniform. A careless reversal of the entry of direction of running a particular section may, therefore, lead to a rise being recorded as a fall, or vice versa. The same trouble of inversion may also occur through confusion in entering a foresight for a backsight. To reduce this danger, a method is being tried of having the recorder make independent approximate readings of the rod after the leveller has completed the precise readings at each instrumental station.

The other party under Mr. Carthew commenced work at Prince Albert and levelled over the branch line of the Canadian Northern Railway to Big River, a distance of eighty-five miles. It is the intention at some future date, to continue this line of levels northerly down the general course of Beaver river.

Work was next commenced at Hudson Bay Junction, and a single line of levels was run over the railway from there to Pas, a distance of eighty-seven miles. This had been already levelled in the previous year, but the elevations of the railway stations and many of the streams had been omitted and the distances between bench-marks had been too long. The single line was run to remedy these matters, and generally to check the original line. No second, or check line, was run if this single line checked with the original determinations at the end of a mile section within one-tenth of a foot. In such case the original elevation was retained and the new line was used only to determine the intermediate new elevations. If a greater discrepancy occurred an investigation was made by further levellings.

On reaching Pas the total disagreement between the single line, the elevations of which were carried through independently, and the mean of the duplicates of the original line amounted to 0.130 foot, in addition to an error of 1.100 feet which was found to have been made in a certain mile of the original line. Correction has been made for the error of 1.100 feet but otherwise the original elevations have been retained.

The line of levels was continued from Pas northeasterly along the Hudson Bay railway. As this was a new line duplicate levels were run in the usual manner. This new line was extended to a point ninety-nine miles from Pas. Here work ended on November 10, and the party returned to Prince Albert. A single line of levels was run from Prince Albert to Hudson Bay Junction, a distance of 162 miles. This line had been run in the year 1912, but was now re-run for reasons similar to those stated for re-running the line from Hudson Bay Junction to Pas. The elevations of numerous streams had been omitted and were now recorded. The total discrepancy between this single line of levels and the mean of the original duplicate levellings amounted to 0.186 foot at the end of the 162 miles. No local error was discovered in the field work of the original line, and no change has been made in the original elevations.

The following tables show the lines of levels along meridians and base lines, and also the lines of precise levels, run from April 1, 1914 to March 31, 1915.



Meridian and Base Line Levels.

Line.	Town- ships or Ranges.	Surveyor.	Miles.
Second meridian east .. .. .	85-88	G. H. Herriot ..	24
Second " " .. .. .	89-92	B. W. Waugh ..	24
23rd base east of Second meridian east.....	1-11	G. H. Herriot ..	66
24th " " " " .. .. .	1-10	B. W. Waugh ..	60
24th " " " " .. .. .	11	G. H. Herriot ..	6
East outline, range 11, east of Second meridian east.....	89 92	" ..	24
Principal meridian.....	81-88	A. H. Hawkins... ..	48
6th base line east of Principal meridian.....	10	A. M. Narraway ..	6
East outline of range 1 east.....	45-48	" ..	24
East " " 3 " .. .. .	38-44	" ..	42
12th base line east of Principal meridian.....	2- 3	" ..	12
13th " " " " .. .. .	1- 3	" ..	14
13th " west " .. .. .	13-14	T. H. Plunkett... ..	10
14th " " " " .. .. .	11-16	" ..	30
19th " east " .. .. .	1- 5	G. H. Herriot ..	30
East outline of range 11 east.....	81-84	B. W. Waugh ..	24
21st base line east of Principal meridian.....	10-11	" ..	12
21st " " " " .. .. .	12-20	G. H. Herriot ..	54
22nd " " " " .. .. .	1	A. H. Hawkins... ..	6
22nd " " " " .. .. .	12-20	B. W. Waugh ..	54
22nd " " " " .. .. .	21-22	G. H. Herriot ..	11
22nd " west " .. .. .	1	A. H. Hawkins... ..	6
23rd " east " .. .. .	21-22	B. W. Waugh ..	10
East outline of range 20 east.....	81-84	G. H. Herriot ..	24
East " " 20 " .. .. .	85-88	B. W. Waugh ..	24
Second meridian.....	56-85	A. H. Hawkins... ..	173
2nd base line west of Second meridian .. .. .	1-30	A. G. Stuart... ..	178
15th " " " " .. .. .	1-21	A. H. Hawkins... ..	127
16th " " " " .. .. .	1-11	E. S. Martindale ..	66
2nd " " Third meridian.....	1-30	A. G. Stuart... ..	178
Fourth meridian.....	1-53	" ..	318
24th base line west of Fourth meridian .. .. .	12-25	G. H. Blanchet... ..	83
25th " " " " .. .. .	13-25	" ..	76
26th " " " " .. .. .	1-25	F. V. Seibert... ..	146
26th " " Fifth meridian.....	1-17	J. A. Fletcher... ..	102
27th " " " " .. .. .	1- 9	" ..	51
29th " " " " .. .. .	1-24	J. R. Akins ..	142
West boundary, Peace River block.....	81-84	L. Brenot... ..	24
Total .. .. .			2,309

Lines of Precise Levels.

Line.	From	To	Railway.	Surveyor.	Miles.
P	Prince Albert .....	Big River.....	Can. Nor. Ry.....	J. T. Carthew ..	85
Q	Winnipeg.....	Swan River.....	" ..	L. O. R. Dozois... ..	321
J	Pas.....	17th base line.....	Hudson Bay Ry....	E. W. Berry.....	99
	Total .. .. .				505
	Lines Revised.				
G	Prince Albert.....	H. B. Junction.....	Can. Nor. Ry.....	E. W. Berry.....	162
J	H. B. Junction.....	Pas.....	" ..	" ..	87
	Short lengths along other lines .. .. .				25
	Total.....				274
	Total of all lines run during the year.....				3,088





Photo by H. S. HOLCROFT, D.L.S.

#### RUINS OF OLD AMMUNITION BUILDING—CHURCHILL.

The whole building except this one chamber is in ruins. About 150 yards away are the ruins of the Battery for which the Ammunition shed was built. This Battery, erected about 150 years ago by the Hudson's Bay Company, commanded the entrance to Churchill harbour.



Photo by H. S. HOLCROFT, D.L.S.

#### HUDSON'S BAY COMPANY'S STORE—YORK FACTORY.

Some of these buildings are more than 100 years old. They are constructed of heavy timber and are yet in good condition. The building on the extreme left is the present local store, the other buildings being used as storehouses.







## SESSIONAL PAPER No. 25b

*Work in Calgary Office.*

All the level books, both those of the meridian and base line surveyors and those of precise level lines, have to be checked. The examination includes checking the reductions, and making a careful scrutiny of all places where the routine methods were not followed in the field work. This last is very laborious, but very important, as it is in such places that errors may enter the work.

As regards the books of meridian and base line levels, these are first examined in a preliminary way and a statement made out showing what additional information is required from the surveyor. This is usually concerned only with the chainage of the topographical features and sketches of the crossings of lakes and rivers. The books themselves are, as a rule, the only available source of information regarding any matters of actual elevation.

The connection of the datum by the surveyor to the best available sea-level datum must then be investigated. This is generally very complicated since the connection is dependent on many lines run on different datum planes. The collating of these assumed datum planes has to be checked and revised again and again. The books are then checked page by page, and any clerical or other errors are noted.

A list of the bench-marks giving their positions, descriptions and elevations is next prepared. Each line is kept separate. The elevations of the bench-marks are the real foundation of the whole system. These are recorded in the field to hundredths of a foot. In compiling the lists of each line, when a surveyor has commenced his work off some previous line, the initial bench-mark heads the lists, and is given the same elevation as it has in the list of the previous line which has always been reduced to sea-level, if such a datum has been available. The same datum is used for all the bench-marks on the new line. When the line terminates by closing on a bench-mark of some other line as, for example, when a base line is run from one meridian to the next, the terminal bench-mark is listed at the end of the new line with the elevation carried through. A comparison of this with its elevation in the list of the line on which it was originally established, serves at once to show the closing error.

This method of listing each line independently places the lists in a form readily available for future adjustment, when sufficient circuits have been run in the field to clear the lines of all but small accidental errors, and it avoids the confusion which would inevitably follow a general adjustment made before sufficient work has been done in the field.

The elevations of the natural features along each line are also compiled in lists. These include the elevation of the ground at the foot of the section and quarter-section posts, about midway between them, and also the elevations of all streams and other water, the distances of each feature from the northeast corner of the particular section being stated. These lists are placed on file, and condensed lists giving, as a rule, only the ground at the northeast corner of each section and the more important other features, are compiled from them for publication.

The draft lists of both bench-marks and natural features are first made out with the elevations recorded in the field books, and then the necessary constants are applied to the draft elevations to reduce them to sea-level, and to correct any clerical errors carried forward inadvertently in the field books.

All lists are made out running north or west independently of the way the line was run in the field. This involves a good deal of extra work, but results in uniformity and clearness.

A profile of each line is made on a horizontal scale of 120 chains to one inch and a vertical scale of 250 feet to one inch. This is a ratio of 1-32, a more exaggerated one than that used on railway profiles, which latter is usually 1-20. The small horizontal scale used, however, requires a greater exaggeration than that shown on a railway profile, in order to clearly bring out small local inequalities.



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The office work in connection with precise levels involves a mass of detail. It includes checking the summation of all the rod readings, and of the stadia intervals in each mile section, checking the transference to the abstract book of the rise and fall in each section, the stadia distance, and the partial discrepancies. The field notes of every mile of levels contain about 480 figures, all of which have to be checked in some form or another.

After the precise level books have been checked a list is prepared for each line giving the positions, descriptions and elevations of all the permanent bench-marks and a further list is made which includes all the other elevations, such as those of railway stations, streams, road crossings, etc. It has been the practice so far, to include in the latter lists the temporary bench-marks at the end of the mile sections. These temporary bench-marks are undoubtedly of great service for future local reference in the field where precision is not required.

The following table gives a summary of the work done in the office during the past twelve months. This is exclusive of the work of compilation of the general report on levelling, previously referred to, which involved the collating and reduction of 8,900 elevations spread over 9,689 miles of levels, and is also exclusive of the re-examination of books dealing with field work done previous to the last two seasons, which is continually going on.

It was supposed, when the levels were first inaugurated along meridians and base lines, that once the lists were made out no further reference would be made to the books but this has proved to be quite a mistake. Continual reference must be made to the original notes and this practice has undoubtedly done much to keep the office records of the whole system so remarkably free from error.

	Original Meridian and Base Line Levels.	Original Precise Levels.	Other Levels.	Total.
<b>FIELD BOOKS.</b>				
Received from the field, April 1, 1914 to March 31, 1915.....	133	55	19	207
Miles of levels recorded in these .....	2,352	599	337	3,288
Field books, entirely examined.....	120	55	19	194
Field books, partly examined.....	29			29
<b>BENCH-MARKS.</b>				
Number of bench-marks compiled for the first time.....	2,837	568	29	3,434
Number of miles in which they occur.....	2,227	599	337	3,163
<b>PROFILES.</b>				
Number of sheets completed.....	62			62
Number of miles on same .....	2,401			2,401

### REPORT OF L. O. R. DOZOIS, D.L.S.

#### PRECISE LEVELS FROM WINNIPEG TO SWAN RIVER.

(To accompany report of J. N. Wallace, D.L.S.)

I left Calgary on May 13, 1914, and reached Winnipeg on the 14th. From this date until the 18th the time was taken up in making preparations for field work.



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Permission was obtained from the Canadian Northern railway to run the line of levels along their track from Winnipeg to Swan river, the conditions being the same as contained in an agreement which had been in force in former seasons. As this line runs within a short distance of lake Manitoba and lake Winnipegosis it was desirable that the elevation of the water in these lakes should be accurately determined. In the case of such large lakes the only satisfactory way to have their variations recorded is by gauge readings at frequent intervals, and to have the zero of the gauge connected to a known elevation above sea-level. In connection with this matter I consulted Mr. Scovil, Acting Chief Engineer of the Manitoba Hydrographic Survey. He agreed to have gauges placed at Delta on the shore of lake Manitoba, and at Winnipegosis on the shore of lake Winnipegosis, and also at the eastern and western sides of Meadow portage, which is a narrow stretch of land, about two miles wide, separating the two lakes. It was further arranged that I should establish bench-marks of as permanent a nature as possible to the shores of these lakes.

This arrangement was an additional benefit to us as it afforded a check on our levels between Delta and Winnipegosis, a distance of 190 miles. It has since been found that our levels and the water levels by way of the lakes as ascertained by Mr. Scovil, check within two-tenths of a foot.

The members of the party reported on the morning of May 18, and levelling operations were at once begun. As the levels were to begin from the middle of the city of Winnipeg it was not practicable to establish camp. The party, therefore, stopped at hotels until the levels were clear of the city. While levelling the central part of the city it was necessary to make use of the early hours of the morning, in order to avoid interference from the daily traffic. The afternoons were spent in levelling along the track, near the outskirts of the city.

Between Winnipeg and Portage la Prairie, a distance of fifty miles, the line runs through open prairie, and the work suffered much delay on account of high wind which prevailed day after day. It was also a source of trouble from Portage la Prairie to Gladstone, a distance of forty miles, although it was neither as strong nor as frequent. From Gladstone to the end of the line the track was for the greater part sheltered from the wind by timber. The summer of 1914 was remarkably dry for Manitoba, and the high temperature exceeded any that had been recorded for a number of years. Little or no time was lost through wet weather until the last month of field work, when several days were lost from this cause.

During this season a method of supplementary levelling was introduced to ensure against the occurrence of large errors. This was done by having the recorder make independent readings of the forward and backward rods at each instrument station, after I had completed the precise readings. His readings were recorded by me in a special book. He read only the middle wire, reading it to the nearest hundredth of a yard. These supplementary readings were made on the forward line only. At the end of every section of levelling, a comparison was made between the difference of elevation as shown by each book, special attention being paid to the sign of the difference of elevation.

This supplementary reading of the rod, and separate record, may be regarded as a semi-independent third line of levels run in conjunction with the regular duplicate forward and backward precise levels. It is not, of course, as good a check against error as an entirely independent line run by a different leveller at a different time, but it has proved very useful in quickly detecting a clerical error in the records which otherwise might not have been noticed until the books were checked in the office.

The progress of the levels suffered appreciably in taking the additional set of readings at each station. I think the retarding effect could safely be stated at ten miles a month of complete levels.



The permanent bench-marks between Winnipeg and Gladstone were established on foundations of buildings. Beyond Gladstone the country becomes more sparsely settled, and concrete pillars had to be made from there to the end of the line at Swan River. Pillars were also made along the branch from Sifton Junction to lake Winnipegosis.

The bench-mark established in foundations consists of a copper plug of a uniform diameter of three-quarters of an inch, and three and one-half inches long. A slit one-sixteenth inch deep is cut across the middle of one end. A hole seven-eighths inch diameter and three and three-quarter inches deep, is drilled in a sound part of the wall and filled with wet cement. The plug is pushed in until flush with the face of the wall, the excess cement being expelled. Before the cement has firmly set, the plug is turned on its axis and the slit made horizontal. This style of bench-mark can be made in fifteen minutes, and has firmly set in a few hours.

During the season seventy-seven permanent bench-marks were established; of these three were on bridge piers, twenty-five were on foundations of houses, and the remaining forty-nine were in concrete pillars.

Three permanent bench-marks were established on the branch from Delta Junction to lake Manitoba, but owing to the marshy nature of the lake shore no bench-mark of a permanent nature could be established closer than three miles to the lake.

One permanent bench-mark was established at lake Dauphin, and four were established on the branch to lake Winnipegosis, also one close to the lake shore for the convenience of the Hydrographic Survey.

The elevations of all the railway stations between Winnipeg and Swan River, amounting to a total of sixty, were recorded. In addition I determined the elevations of forty-eight streams and of thirty-three roads crossing the line of levels.

Several photographs of bench-marks were taken in order to enable them to be more readily found in future. Photographs are undoubtedly of considerable value when used with the descriptions, as they show many useful details which can not be stated in a description. The accumulated discrepancy between the forward and backward measures showed no marked tendency to increase in a positive or negative direction. It passed through zero twenty-five times during the season. The greatest positive accumulation of any one place was  $+0.048$  foot at 168 miles and the greatest negative accumulation was  $-0.119$  foot at the end of 246 miles. The final total discrepancy at the end of the line (280 miles) was  $-0.0054$  foot. The partial discrepancy for a mile section was positive in forty-seven per cent, and negative in fifty-three per cent, of the total number of sections. The discrepancy exceeded 0.010 foot in only twenty-five per cent of the sections.

The probable error of the mean of a mile section is 0.0029 foot, and the probable error of the mean for the whole length of 280 miles of main line is 0.048 foot.

The line was completed to Swan River on October 17, exactly five months from the date the work was begun from Winnipeg. During this period, 321 miles of levels were run. This is at the average rate of sixty-four miles per month. The total mileage is distributed as follows:—

	Miles.
Winnipeg to Swan River. . . . .	280
Delta Junction to Lake Manitoba. . . . .	15
Ochre River to Lake Dauphin. . . . .	5
Sifton Junction to Lake Winnipegosis. . . . .	21
	<hr/>
	321

It should be remembered that in addition to the duplicate lines of levels a third approximate line was run by having the recorder make additional independent readings at each station.



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From October 19 to 22, I was engaged on miscellaneous levels between Swan River and Hudson Bay Junction. The party was paid off at Hudson Bay Junction on October 23, and I left on the following day for Calgary, arriving there on the night of the 26th.

## REPORT OF E. W. BERRY, D.L.S.

## LEVELS ALONG CANADIAN NORTHERN AND HUDSON BAY RAILWAYS.

*(To accompany report of J. N. Wallace, D.L.S.)*

The work carried out by me during the past season comprised the running of levels along the Canadian Northern and Hudson Bay railways from Hudson Bay Junction to a point ninety-nine miles northeasterly from Pas, and also a line from Prince Albert to Hudson Bay Junction. In addition certain miscellaneous work was carried out on the branch line to Big River. These totalled in all 371 miles, of which 100 miles were original levels, and the remainder single lines of levels over the work of previous seasons.

I left Calgary on August 6, 1914, and reached Prince Albert the next day. Having engaged men there and secured materials for bench-marks, I left on August 10 for Hudson Bay Junction, where I arrived the same day.

A single line of levels along the Canadian Northern railway from Hudson Bay Junction to Pas was commenced on the 11th. The line of railway runs through a country which is largely composed of spruce and tamarack swamps. In the swampy sections the track yields to the pressure of a train or handcar and recovers its original elevation very slowly. This makes levelling difficult. Many of the temporary bench-marks of the previous season's work had moved more than a tenth of a foot, and on this account I had to run twenty miles twice.

The party consisted of eight men, consisting of leveller, recorder, cook, bench-mark man, two rod men, umbrella man, and a pilot for the handcar. We camped in tents, moving twice a week by freight train. The usual move was two sidings, about fourteen miles. The weather was fine during August, but some days were lost in September on account of heavy rains.

The twelve permanent bench-marks established the year before were in good condition with two exceptions. I made three new permanent bench-marks, and recorded the elevations of all the railway stations and of four streams, which had not been determined in the original line.

The work was completed on September 12. A precise level line running northeasterly along the Hudson Bay railway towards Port Nelson, was then commenced. The total length of the Hudson Bay railway from Pas to Port Nelson is about 440 miles. At the end of October, 1914, steel had been laid for 165 miles. It is expected that trains will be running along this line to a point 220 miles from Pas by the spring of 1915. As the road bed was new it was difficult to get precise results. The first twenty miles are on firm ground, with the exception of a few miles in the vicinity of Little Frog lake. This portion of the line had also been ballasted for some months before levelling started. From here on, the condition of the track got steadily worse for precise levelling, because the construction work was farther from completion. The country traversed by the line also becomes more swampy as it proceeds. For many miles there was no ballast yet laid and I had to use either the track, resting on the original mossy surface, or the surface itself, to afford a basis for the turning points. Ballasting was in progress from the time the work was begun until October 23, and interruptions from gravel and material trains occurred nearly every half hour. About October 23 the ballasting was completed. After this, interruptions were confined to the passing of trains of supplies and materials going to the end of steel.



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Permanent bench-marks on concrete pillars were established at approximately the same distances apart as railway sidings. No bench-mark was placed within half a mile of any siding, and generally the distance between a siding and a bench-mark is from one to three miles. If bench-marks are placed close to sidings, they are liable to destruction when buildings are erected later. There are thirteen bench-marks or pillars, and two in the concrete foundations of railway tanks. For the first thirty miles, the usual temporary bench-mark, consisting of a railway spike in a telephone pole, was used. After this, the poles were found not to be firm enough for bench-marks, so marks cut in boulders and nails on stumps were used. Besides bench-marks the following elevations were recorded: base of rail at all sidings and bridges, and water level of streams and lakes crossed by the railway. Connection was made to bench-marks on the 15th, 16th and 17th base lines. The elevations of three streams and lakes were recorded, these being the only ones of any consequence crossed by the line.

The weather was rather unfavourable while this line was being run. High winds prevailed during most of September and October. There were some days lost on account of rain and heavy snow-storms. In some localities, also, the fog hangs low over swamp lands till late in the morning, making work impossible until it has disappeared.

For transport I depended on the trains of the Hudson Bay Construction company. For the accommodation of their workmen and the general public, the company ran trains about twice a week. Owing to the unfinished condition of the road-bed, however, no regular time-table was followed, and it was often impossible to find out within a day or two when a train would arrive. Trains left Pas at seven in the morning and generally reached the end of steel before midnight. On October 26 the train service stopped suddenly without notice (owing to a strike, as I subsequently learned); a heavy fall of snow made it impossible to use the hand car, as there were no trains running which would have cleared the track. Work was continued on foot until a permanent bench-mark was reached seven miles beyond our camp. On November 7, a train came down from Pas in charge of the Royal Northwest Mounted Police to bring out some parties farther down the line, who were short of provisions. Being unable to obtain any assurance that any more trains would be run during the winter, I arranged to have my outfit hauled back on this train, and returned to Pas on November 8.

Most of the party were paid off on our arrival at Pas. The outfit was shipped by freight to Prince Albert and on November 10, I left Pas arriving at Prince Albert the following day. A few days were then spent on office work until the camp outfit arrived from Pas. I then stored most of the outfit and arranged to re-level certain sections along the Canadian Northern railway line from Prince Albert to Big river. For this purpose I took two men with me, and hired a third man locally for a day or two when necessary. The sections which I re-levelled were scattered at intervals over the whole length of the line. A connection was also made from the end of the line at Big river to the levels of the 15th base line, using the water level of Cowan lake as a connecting link. This work was completed on December 1. We got board at a hotel at Shellbrook and at houses or stores in Canwood, Polwarth and Big River.

The next work undertaken was a second levelling of the line from Prince Albert to Hudson Bay Junction. This was commenced on December 5, 1914, and ended on January 20, 1915. The total distance is 162 miles. The party consisted of six men. We boarded at hotels until we passed Tisdale, and at lumber camps from Crooked river to Hudson Bay Junction. A single line was run through. Twenty-six sections of one mile each were, however, levelled twice because of disturbances of temporary bench-marks greater than 0.10 foot since the original levelling. These disturbances were found to be local, and did not affect the accuracy of the permanent bench-marks.



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This line of railway is in open country from Prince Albert to Tisdale, a distance of eighty-nine miles, but east of Tisdale the country is wooded. The trains did not run as often this winter as usual. There was an express train from Winnipeg to Prince Albert every second day, which returned the following day. On the days that the express train did not run, there was a mixed train from Prince Albert, which went only as far as Mistatim. Our baggage was shipped by freight on the mixed, or by express on the passenger train.

In the open country during the two weeks before Christmas, we were inconvenienced by low temperatures accompanied by high winds. Except for this, conditions generally were favourable. The days were cloudy, and the track being frozen solid no difficulty was met from shifting turning points.

On this line there is a permanent bench-mark on a concrete pillar at every railway station and siding, and many such pillars have been placed midway between stations. The pillar at Weldon was destroyed when an elevator was built. One of the pillars near Hudson Bay Junction was also damaged, and a new pillar to take its place was made this season. All the other permanent bench-marks on this line were in good condition. The elevations of forty-nine streams crossing the line, which had been omitted in the original levels, were recorded during this re-levelling.

On January 21, 1915, I returned to Prince Albert and on the 22nd, I went to Debden on the Big River line and re-levelled a mile section near there. Next day I returned to Prince Albert, and connected the levels of the line to Hudson Bay Junction to a bench-mark of the Grand Trunk Pacific railway. On January 25, having paid off the party, I left for Calgary, where I arrived next day.



## APPENDIX No. 61.

## ABSTRACT OF THE REPORT OF B. W. WAUGH, D.L.S.

## BASE LINE SURVEYS IN THE VICINITY OF THE LOWER NELSON RIVER, NORTHERN MANITOBA.

The route followed to reach the starting point of our survey at the northeast corner of tp. 80-9-E., was by steamer from Selkirk to Whiskey Jack portage, between Cross and Sipiwesk lakes, and from there by barge to Split lake and up Ripple river to our destination.

This district may now be more easily reached by the Hudson Bay railway. At the time of our survey the railway was built to within twenty miles of Manitou rapids in tp. 78-6-E.

Our main supplies for the season's work were cached at Manitou. These supplies were forwarded from time to time by canoes to different points along lower Nelson river.

During a season of high water a good canoe route from Split lake to Kettle rapids in tp. 85-19-E. is afforded by Landing river as far as tp. 81-11-E., across a short portage into Moosenose lake, thence down Moosetongue river to Butnau lake, down Butnau river to Cache lake, across a portage into Kettle river, and down this river to the Nelson. On account of the exceedingly low water this season we were compelled to freight by Nelson river, which, below Gull lake, is a hard and dangerous river to travel, the current there being very swift and the river containing many rapids.

During the winter we used dogs as a means of transportation. Our base of supplies was at Long Spruce rapids, on Nelson river, in tp. 85-20-E.

Work continued steadily on the line throughout the season, except for a few days in the latter part of January, when we had to wait for Nelson river to freeze over at its mouth and for favourable conditions for crossing. Owing to the tide and its numerous cross currents we were unable to take our levels across the river there with any degree of accuracy.

On February 3, having completed the 24th base line east to Hudson bay, we started homeward, travelling by dog trains to camp 33 of McMillan Bros., where we turned over our dogs and other transportation outfit to Mr. G. H. Herriot, D.L.S., and proceeded from there on McMillan's tote road to the end of the steel at camp 21, and thence on a construction train to Pas.

The country covered by our survey may be generally described as muskeg, with numerous open and tamarack swamps drained to a certain extent by Nelson river and its tributaries. The soil is decayed moss and black loam with the exception of a strip of land about a half mile wide, bordering on the Nelson, where the soil is clay and clay loam. The southern portion of the country is timbered with spruce and tamarack up to six inches in diameter, and of poor quality, but from the NE. cor. tp. 88-2-E. to Port Nelson the country is very lightly timbered with small burnt spruce, with occasional green spruce bluffs.

For the most part the surface is very level, though rough and hummocky in places, and no slopes of any extent occur except in the immediate vicinity of Nelson river.

This river from Split lake north varies in width from one-half to one and one-half miles, except at its mouth, where it gradually widens to seven or eight miles. The chief rapids along this portion of the river are: Birthday rapids, in tp. 84-12-E.,



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with a drop of four feet; Gull rapids, in tp. 85-15-E., with a drop of seventy-five feet in three miles; Kettle rapids, in tp. 85-19-E., with a drop of about eighty feet; Long Spruce rapids, in tp. 85-20-E., with a drop of about seventy feet in a distance of seven miles; and Limestone rapids, which are a series of rapids from the mouth of Limestone river to Prairie point, a distance of about nine miles, with a drop of over one hundred and fifty feet. Along this portion of the river the ice, which piles up on the shores in the spring, is to be found there as late as August. The banks of the river are, for the most part, clay cut banks from forty to seventy-five feet high.

In sec. 33, tp. 80-11-E., our line crossed Landing river. The lower part of this stream is from five to ten chains in width, with no perceptible current. It has, however, two rapids which are passed by one portage. It is navigable by canoe at any season during open water. The upper part, on the other hand, is much narrower and very crooked, containing many rapids. It is navigable by canoe only during high water. The river empties into the southeastern arm of Split lake.

Gull lake in townships 84 and 85, ranges 13 and 14, is merely a widening of Nelson river, being about ten miles long and averaging one and one-half miles in width. The shores are for the most part high clay banks, but in some places they are low and swampy. There is quite a perceptible current in the lake causing bad seas in an easterly wind.

Butnau river, rising in Butnau lake, empties into the Nelson from the south in tp. 84-16-E. Its lower part has very low marshy banks, but the upper part has high banks (from which the river derives its name) fairly well wooded with good spruce up to eighteen inches in diameter. In high water it is good for canoeing.

Kettle river empties into the Nelson below Kettle rapids in tp. 85-19-E. It is about fifty feet wide and flows between clay banks from forty to fifty feet high, well wooded with spruce from six to eighteen inches in diameter. In low water it forms a very poor canoe route, being very swift and shallow, and necessitating many short portages, but in high water it is exceptionally good for down-stream travel. Kettle river was the first stream in which we found brook trout; they are very plentiful there and range from eight to eighteen inches in length.

Limestone river empties into the Nelson from the west just below the first Limestone rapid. It is about five chains in width with a current of from four to six miles per hour. Its banks are of clay from fifty to seventy-five feet high, wooded with scattered spruce and tamarack, up to eighteen inches in diameter, and occasional clumps of jackpine up to six inches in diameter. It has no rapids of note except at its mouth, but the current is so strong that in travelling up-stream by canoe tracking has to be resorted to. Rock sturgeon and trout are found near its mouth.

Weir river, rising in North Fishing lakes, is about 160 miles long and 150 feet wide, and empties into the Nelson from the west about thirty miles from its mouth. Its banks, on the upper portion are ten feet high, wooded with spruce and tamarack from six to eighteen inches in diameter. A tote road is now being cut along this river in order to haul the timber at North Fishing lakes and along its banks to Port Nelson. This appears to be the last river in which fresh-water fish are caught. The main catch is sucker with occasional trout, rock sturgeon, jackfish and whitefish. It forms a poor canoe route on account of its many rapids and its crookedness.

Roblin river and Cooper creek cross the Second meridian east in townships 91 and 92 respectively, and flowing in a northeasterly direction empty into a chain of small lakes. These lakes, viz.: Donald, Spence, Curtis, Fiddler, Dewar and numerous other smaller ones are said to contain jackfish, sucker and whitefish. They are bordered with thick spruce up to six inches in diameter of good quality. Roblin river flows from Spence lake of this group and paralleling Weir river flows into the Nelson about eight miles below it. The river is about seventy feet wide with a strong current, but from the amount of water it carries it is improbable that it draws all the water from this chain of lakes. The banks of the river are low and timbered with spruce and tamarack from six to eighteen inches in diameter. The river is poor for canoeing.



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A small belt of timber of about one square mile was found in tp. 88-22-E. It consists of spruce of good quality up to eighteen inches in diameter. This belt of timber together with scattered spruce and tamarack up to eighteen inches in diameter along Roblin, Weir, Limestone, Kettle, and Butnau rivers comprises the only timber of value found in the country.

No traces of mineral were seen and the only rock noticed consisted of a few outcroppings of granite along Nelson river.

Hay is found in small quantities along the banks of some of the smaller creeks flowing into the Nelson in the neighbourhood of Gull lake and above Kettle rapids. Prairie point, on Nelson river at Last Limestone rapids, is said to contain sixty acres of good hay land.

A large amount of water-power is available at the larger rapids along the Nelson, but in most cases they would require a long intake.

If the country were drained and stripped of its moss in order to let the frost out of the ground it would then be suitable for agricultural purposes, but it is not suitable in its present condition. The Nelson and its tributaries afford good drainage facilities.

On account of the extraordinarily poor year for game, we saw very little of any kind, but in ordinary seasons caribou, moose, and bear are said to be plentiful. Fox, marten, otter and mink are the chief fur-bearing animals.

Sturgeon, whitefish, jackfish and trout are the most valuable fish of the district.

The climate of 1914 was extraordinary for this country. There was very little rainfall in the summer and a fine open fall followed. The winter was not extremely cold, although the thermometer stayed at 20 degrees below zero nearly all November, December and January. In February the thermometer seldom registered below zero, and in this month there was an average depth of eighteen inches of snow.



## APPENDIX No. 62.

## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.

Table I.—Declination Observations.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
At NE. cor. sec. 24.....	45	1	E.	Aug. 3, '14	14 02 7	A. M. Narraway.
At " 12.....	45	1	"	" 6, '14	13 38 9	"
41 26 S.- " 25.....	46	1	"	July 3, '14	14 06 5	"
44 99 S.- " 12.....	46	1	"	" 11, '14	03 6	"
2 25 E.- " 35.....	48	1	"	June 14, '14	13 57 0	"
42 65 S.- " 36.....	48	1	"	" 16, '14	14 13 0	"
69 34 E.- " 32.....	80	1	"	Nov. 15, '13	33 6	B. W. Waugh.
27 08 E.- " 34.....	80	1	"	" 18, '13	23 5	"
54 66 E.- " 36.....	80	1	"	" 21, '13	15 10 1	"
40 00 E.- " 31.....	44	2	"	Aug. 10, '14	13 53 5	A. M. Narraway.
60 00 E.- " 34.....	44	2	"	" 17, '14	46 8	"
17 29 E.- " 31.....	48	2	"	July 17, '14	42 4	"
47 00 E.- " 33.....	48	2	"	" 20, '14	15 14 1	"
51 19 E.-NW " 31.....	76	2	"	Feb. 3, '14	27 8	B. W. Waugh.
45 00 E.-NE " 34.....	80	2	"	Nov. 25, '13	16 31 7	"
39 97 S.- " 1.....	38	3	"	Oct. 9, '14	13 15 8	A. M. Narraway.
43 04 S.- " 13.....	39	3	"	" 2, '14	43 0	"
8 84 S.- " 12.....	39	3	"	" 6, '14	12 23 2	"
57 56 S.- " 1.....	41	3	"	Sept. 23, '14	12 54 4	"
21 85 S.- " 25.....	41	3	"	" 20, '14	46 0	"
40 00 E.- " 36.....	44	3	"	Aug. 20, '14	13 10 3	"
10 00 W.- " 35.....	44	3	"	" 25, '14	02 8	"
2 00 S.- " 36.....	44	3	"	" 27, '14	25 7	"
6 63 E.-NW " 31.....	80	3	"	Nov. 28, '13	15 54 7	B. W. Waugh
10 11 E.-N.E " 34.....	76	4	"	Feb. 19, '14	17 39 7	"
40 00 E.-NW " 32.....	80	4	"	Dec. 7, '13	14 30 0	"
7 00 E.-NE " 31.....	76	5	"	Feb. 23, '14	18 30 4	"
68 30 E.- " 31.....	80	5	"	Dec. 13, '13	13 37 4	"
2 39 E.- " 33.....	76	6	"	Feb. 28, '14	13 13 3	"
57 52 E.- " 35.....	80	6	"	Dec. 27, '13	10 33 4	"
*33 87 E.- " 31.....	81	7	"	" 31, '13	12 14 5	"
41 87 E.-NW " 31.....	80	9	"	Jan. 14, '14	13 27 2	"
47 55 E.-NE " 34.....	80	9	"	" 20, '14	14 16 1	"
At " 31.....	11	10	"	Oct. 17, '14	10 56 4	C. F. Aylsworth.
24 00 W.- " 8.....	12	10	"	" 23, '14	12 05 3	"
60 00 E.-NW " 18.....	12	10	"	" 24, '14	11 1	"
At NE " 18.....	12	10	"	" 27, '14	11 28 8	"
64 00 W " 30.....	12	10	"	" 27, '14	12 03 2	"
At " 30.....	12	10	"	" 27, '14	11 38 4	"
At SW " 18.....	12	10	"	" 29, '14	13 32 8	"
50 00 N.-NE " 6.....	12	10	"	" 29, '14	14 1	"
At NW " 19.....	12	10	"	" 29, '14	11 11 4	"
2 89 E.-NE " 31.....	20	10	"	May 20, '14	11 9	A. M. Narraway.
7 30 E.- " 34.....	20	10	"	" 25, '14	19 6	"
56 57 E.- " 35.....	20	10	"	" 26, '14	14 5	"
26 00 E.- " 31.....	13	11	"	Sept. 10, '14	10 19 4	C. F. Aylsworth.
17 00 S.- " 31.....	14	11	"	Aug. 31, '14	9 49 8	"
7 00 E.- " 31.....	14	11	"	" 31, '14	54 8	"
42 00 E.- " 31.....	14	11	"	" 31, '14	10 11 3	"
At " 8.....	14	11	"	Sept. 28, '14	9 31 0	"
30 00 S.- " 9.....	14	11	"	" 29, '14	35 6	"
25 00 N.-SE " 4.....	14	11	"	" 29, '14	10 24 2	"
At N.E. cor. sec. 36.....	48	1	Pr.	June 8, '14	14 04 0	A. M. Narraway.
46 34 N.- " 24.....	72	1	"	" 11, '13	24 0	B. W. Waugh.
57 51 N.- " 25.....	72	1	"	" 13, '13	15 06 2	"



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## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
52° 12' N.-E. cor. sec. 1	73	1	Pr.	June 16, '13	16 31.6	B. W. Waugh.
19° 48' N. " 12	73	1	"	" 17, '13	17 23.7	"
63° 33' N. " 12	73	1	"	" 18, '13	18 05.6	"
72° 55' N. " 13	73	1	"	" 19, '13	16 34.4	"
47° 50' N. " 36	73	1	"	" 21, '13	15 49.9	"
45° 68' N. " 1	74	1	"	" 23, '13	14 29.6	"
7° 36' N. " 12	74	1	"	" 24, '13	18.9	"
64° 76' N. " 12	74	1	"	" 26, '13	17.5	"
59° 48' N. " 13	74	1	"	" 27, '13	15 02.5	"
37° 55' N. " 24	74	1	"	" 28, '13	01.7	"
7° 01' N.-SE. " 1	75	1	"	July 1, '13	13 08.6	"
63° 64' N. " 1	75	1	"	" 3, '13	16 41.5	"
39° 53' N.-NE. " 1	75	1	"	" 4, '13	11 54.5	"
39° 00' N. " 12	75	1	"	" 5, '13	15 06.2	"
21° 59' N. " 13	75	1	"	" 7, '13	16 18.7	"
40° 20' N. " 13	75	1	"	" 8, '13	11.5	"
37° 67' N. " 24	75	1	"	" 9, '13	13 10.9	"
9° 81' N. " 25	75	1	"	" 10, '13	15 08.0	"
19° 51' N. " 36	75	1	"	" 12, '13	17 24.0	"
47° 54' N. " 36	75	1	"	" 14, '13	15 52.9	"
49° 84' N. " 24	76	1	"	" 17, '13	16 36.4	"
57° 62' N. " 25	76	1	"	" 19, '13	56.9	"
50° 10' E. " 36	76	1	"	" 23, '13	15 34.4	"
2° 05' N. " 12	77	1	"	" 21, '13	18 13.6	"
66° 45' N. " 12	77	1	"	" 24, '13	16 08.1	"
35° 91' N. " 1	78	1	"	Aug. 1, '13	17 58.3	"
16° 03' N. " 12	78	1	"	" 2, '13	16 31.7	"
45° 72' N. " 13	78	1	"	" 4, '13	15 49.8	"
79° 43' N. " 36	79	1	"	" 14, '13	15 19.3	"
35° 83' N. " 12	80	1	"	" 21, '13	23.9	"
15° 00' E. " 31	14	2	"	July 4, '14	12 17.3	R. C. Purser.
At " 34	14	2	"	" 7, '14	18.8	"
20° 00' E. " 35	14	2	"	" 7, '14	35.0	"
52° 47' W. " 33	76	2	"	Mar. 19, '14	14 58.6	B. W. Waugh.
5° 00' N.-SE. " 1	15	3	"	Nov. 10, '14	12 18.1	R. C. Purser.
20° 00' S.-NE. " 1	15	3	"	" 10, '14	22.6	"
70° 00' N. " 6	22	3	"	May 27, '14	13 57.4	C. F. Aylsworth.
20° 00' N. " 5	22	3	"	June 2, '14	22.2	"
At " 2	22	3	"	" 12, '14	00.5	"
At " 14	22	3	"	" 20, '14	14.0	"
At " 23	22	3	"	" 24, '14	12 32.0	"
12° 00' E. " 28	22	3	"	July 4, '14	13 14.3	"
30° 00' W. " 33	22	3	"	" 6, '14	17.4	"
50° 00' E. " 8	22	3	"	" 14, '14	10.4	"
At " 17	22	3	"	" 15, '14	03.3	"
At " 20	22	3	"	" 17, '14	26.1	"
30° 00' E. " 31	22	3	"	" 18, '14	27.4	"
At " 31	22	3	"	" 21, '14	30.5	"
80° 89' W. " 33	76	3	"	Mar. 24, '14	17 24.0	B. W. Waugh.
40° 00' E. " 1	22	4	"	May 27, '14	13 40.7	C. F. Aylsworth.
8° 00' N. " 24	22	4	"	June 23, '14	12 44.9	"
40° 00' W. " 3	23	5	"	May 20, '14	13 38.7	"
27° 00' E. " 2	23	5	"	" 20, '14	12 52.6	"
40° 00' E. " 3	23	5	"	" 20, '14	13 40.1	"
32° 00' N. " 6	69	7	"	Sept. 18, '14	15 52.0	P. E. Palmer.
41° 00' N. " 7	69	7	"	" 21, '14	14 08.0	"
20° 00' N. " 19	69	7	"	" 24, '14	15 05.8	"
37° 00' E. " 8	69	7	"	" 28, '14	36.9	"
30° 00' N. " 5	69	7	"	Sept. 29, '14	16 08.9	"
50° 00' N. " 17	69	7	"	" 30, '14	14 30.5	"
30° 00' E. " 21	69	7	"	Oct. 12, '14	15 31.7	"
36° 00' N. " 9	69	7	"	" 14, '14	14 36.9	"
6° 00' S. " 27	69	7	"	" 16, '14	15 14.9	"
56° 00' E. " 22	69	7	"	" 20, '14	03.6	"



## SESSIONAL PAPER No. 25b

## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

Place.	Township.	Range	Meridian.	Date.	Declination.	Observer.
24° 00' S.-NE cor. sec. 35.	68	8	Pr.	Sept. 22, '14	14 33.8	P. E. Palmer.
37° 00' S.	30.	8	"	Oct. 30, '14	16 04.4	"
56° 00' W.	19.	8	"	Nov. 5, '14	25.7	"
10° 00' E.	20.	8	"	" 6, '14	15 24.2	"
14° 00' N.	17.	8	"	" 7, '14	11.8	"
48° 00' E.	11.	8	"	Sept. 15, '14	14 45.3	"
44° 00' E.	19.	8	"	" 16, '14	15 55.9	"
20° 00' N.	25.	8	"	Oct. 2, '14	15 44.6	"
16° 00' W.	11.	8	"	Nov. 20, '14	01.3	"
43° 00' S.	33.	9	"	Dec. 8, '14	14 35.5	"
25° 00' W.	20.	9	"	" 14, '14	15 04.7	"
6° 00' N.	8.	9	"	" 16, '14	13 38.1	"
12° 00' N.	9.	9	"	" 17, '14	14 53.7	"
48° 00' W.	7.	9	"	" 19, '14	18 20.5	"
39° 00' S.	6.	9	"	" 28, '14	12 53.8	"
10° 00' W.	33.	9	"	Nov. 28, '14	13 07.5	"
24° 00' S.	25.	9	"	" 16, '14	15 34.9	"
60° 00' W.	24.	9	"	" 17, '14	04.1	"
20° 00' N.	12.	9	"	" 19, '14	38.3	"
At	36.	9	"	" 23, '14	35.7	"
15° 00' N.	11.	9	"	" 30, '14	13 47.1	"
12° 00' S.	23.	9	"	Dec. 1, '14	14 40.8	"
5° 00' S.	9.	10	"	" 29, '14	13 46.9	"
28° 66' W.	36.	4	11	June 29, '13	13 20.0	A. G. Stuart.
28° 66' W.	36.	4	11	" 29, '13	20.5	"
24° 00' W.	32.	65	11	Aug. 19, '14	16 21.5	P. E. Palmer.
28° 00' E.	32.	65	11	" 26, '14	14 57.0	"
60° 00' N.	12.	65	11	" 22, '14	19 26.7	"
20° 00' N.	18.	65	11	" 28, '14	16 17.9	"
17° 00' E.	7.	65	11	" 30, '14	15 45.3	"
20° 00' W.	19.	65	11	" 31, '14	57.0	"
30° 00' E.*	22.	65	11	Sept. 5, '14	20 39.5	"
60° 00' E.	22.	65	11	" 7, '14	22 17.6	"
20° 00' E.	12.	66	11	" 10, '14	18 05.8	"
12° 00' S.	18.	65	12	July 17, '14	16 54.1	"
21° 00' W.	11.	65	12	Aug. 3, '14	01.9	"
25° 00' N.	1.	65	12	" 4, '14	15 47.5	"
40° 00' N.	12.	65	12	" 6, '14	54.5	"
8° 00' E.	22.	65	12	" 7, '14	17 42.3	"
50° 00' N.	27.	65	12	" 10, '14	15.6	"
56° 00' N.	14.	65	12	" 11, '14	16 53.3	"
30° 00' E.	23.	65	12	" 13, '14	58.9	"
40° 00' N.	24.	65	12	" 14, '14	17 51.5	"
50° 00' N.	26.	65	12	" 15, '14	18 42.1	"
10° 00' E.	35.	65	12	" 17, '14	19 39.0	"
45° 00' N.	34.	48	13	June 13, '14	16 24.2	T. H. Plunkett.
29° 50' S.	36.	51	13	May 29, '14	20.0	"
55° 00' S.	25.	51	13	" 31, '14	18.4	"
At	35.	52	13	" 23, '14	28.5	"
41° 00' E.	36.	52	13	" 22, '14	20.8	"
9° 45' S.	1.	52	13	" 28, '14	26.0	"
40° 00' S.	24.	52	13	" 26, '14	28.9	"
At	11.	65	13	July 7, '14	14 04.9	P. E. Palmer.
25° 00' N.-NE cor. sec. 3.	3.	65	13	July 8, '14	19 11.2	"
61° 50' E.	32.	52	14	May 6, '14	17 10.4	T. H. Plunkett.
64° 66' E.	33.	52	14	" 8, '14	16 44.9	"
19° 22' E.	36.	52	14	" 11, '14	45.7	"
65° 30' W.	36.	68	14	Dec. 13, '13	11 03.6	G. H. Herriot.
45° 00' W.	34.	68	14	" 17, '13	17 45.9	"
30° 00' E.	31.	52	15	April 26, '14	16 40.2	T. H. Plunkett.
5° 00' E.	32.	52	15	" 27, '14	35.0	"
40° 00' E.	32.	52	15	" 28, '14	34.9	"
73° 00' E.	32.	52	15	" 28, '14	37.7	"
39° 00' E.	33.	52	15	" 29, '14	37.5	"



## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
16° 00 E.-NE cor. sec.	34.	52 15	Pr.	April 30, '14	19° 8	T. H. Plunkett.
30° 00 E.-"	36	52 15	"	May 1, '14	22° 2	"
49° 60 E.-"	36.	52 15	"	" 3, '14	25° 9	"
42° 47 E.-"	34.	48 16	"	Mar. 22, '14	17 52° 5	"
At	35.	63 16	"	Sept. 23, '14	59° 3	J. S. Galletly.
10° 00 E.-"	23.	63 16	"	" 24, '14	18 03° 8	"
60° 00 W.-"	23.	63 16	"	" 28, '14	69° 3	"
20° 00 S.-"	25.	64 16	"	Aug. 27, '14	12° 7	"
5° 00 N.-"	2.	64 16	"	Sept. 18, '14	33° 2	"
20° 00 E.-"	11.	64 16	"	" 21, '14	17 36° 8	"
51° 00 E.-"	36.	48 18	"	Mar. 17, '14	28° 9	T. H. Plunkett.
16° 00 E.-"	33.	52 18	"	Jan. 22, '14	16 27° 4	"
60° 00 E.-"	36.	52 18	"	" 27, '14	21° 1	"
50° 25 E.-"	32.	19 19	"	April 28, '14	15 00° 7	S. L. Evans.
2° 42 E.-"	35.	52 19	"	Jan. 20, '14	59° 1	T. H. Plunkett.
15° 00 S.-"	30.	61 19	"	Dec. 31, '14	18 19° 0	J. S. Galletly.
43° 50 E.-"	32.	52 20	"	Jan. 5, '14	17 38° 3	T. H. Plunkett.
56° 00 E.-"	34.	52 20	"	" 9, '14	50° 4	"
2° 00 S.-"	22.	61 20	"	Dec. 12, '13	57° 1	P. B. Street.
4° 00 N.-"	16.	61 20	"	" 13, '13	18 05° 1	"
61° 63 E.-"	31.	52 21	"	" 29, '13	17 17° 1	T. H. Plunkett.
20° 00 N.-"	27.	60 21	"	Oct. 31, '13	56° 7	P. B. Street.
16° 00 N.-"	20.	60 21	"	Dec. 18, '13	42° 8	"
30° 00 N.-"	11.	61 21	"	Nov. 16, '13	18 06° 6	"
52° 00 N.-"	3.	61 21	"	" 21, '13	17 34° 1	"
4° 00 S.-"	5.	61 21	"	Dec. 17, '13	55° 3	"
6° 77 E.-"	34.	48 22	"	Feb. 26, '14	57° 2	T. H. Plunkett.
41° 50 E.-"	34.	52 22	"	Dec. 24, '13	17° 2	"
22° 00 N.-"	17.	59 22	"	Feb. 15, '14	18 00° 5	P. B. Street.
21° 00 N.-"	3.	60 22	"	Jan. 15, '14	17 47° 3	"
18° 00 N.-"	9.	60 22	"	" 22, '14	18 07° 8	"
46° 95 E.-"	34.	52 23	"	Dec. 20, '13	17 25° 6	T. H. Plunkett.
42° 00 N.-"	20.	58 23	"	April 5, '14	18 07° 8	P. B. Street.
44° 00 N.-"	18.	58 23	"	" 27, '14	21° 4	"
20° 00 S.-"	33.	58 23	"	May 8, '14	43° 3	"
27° 29 E.-"	33.	52, 24	"	Dec. 11, '13	36° 3	T. H. Plunkett.
61° 21 E.-"	36.	52 24	"	" 15, '13	17 27° 7	"
25° 00 S.-"	29.	57 24	"	Mar. 12, '14	47° 7	P. B. Street.
58° 00 N.-"	33.	57 24	"	" 13, '14	18 11° 9	"
40° 00 N.-"	6.	61 24	"	Dec. 3, '14	17 28° 9	J. S. Galletly.
40° 00 N.-"	7.	61 24	"	" 4, '14	18 00° 9	"
50° 00 N.-"	18.	61 24	"	" 4, '14	17 52° 9	"
At	4.	61 24	"	" 6, '14	18 14° 7	"
35° 00 N.-"	16.	61 24	"	" 6, '14	03° 5	"
36° 00 E.-"	34.	52 25	"	" 8, '13	16 55° 9	T. H. Plunkett.
At	31.	52 26	"	Nov. 25, '13	17 37° 8	"
5° 29 E.-"	36.	52 26	"	Dec. 1, '13	18 55° 0	"
30° 00 W.-"	21.	54 26	"	Oct. 1, '13	19 00° 0	P. B. Street.
5° 00 N.-"	18.	54 26	"	Oct. 4, '13	02° 8	"
At	20.	54 26	"	" 5, '13	18 29° 9	"
At	20.	54 26	"	" 5, '13	34° 0	"
6° 00 N.-"	27.	9 27	"	July 27, '14	16 10° 4	R. C. Purser.
65° 83 E.-"	31.	48 27	"	Sept. 7, '13	17 43° 6	T. H. Plunkett.
32° 72 E.-"	36.	48 27	"	" 11, '13	18 11° 4	"
20° 00 N.-"	20.	53 27	"	Aug. 28, '13	20 01° 8	P. B. Street.
47° 00 N.-"	3.	54 27	"	" 4, '13	18 14° 3	"
55° 00 N.-"	11.	54 27	"	Sept. 5, '13	19 03° 3	"
At	35.	55 27	"	Oct. 21, '14	18 22° 5	J. S. Galletly.
At	34.	55 27	"	" 23, '14	30° 3	"
40° 00 W.-"	33.	55 27	"	" 24, '14	21° 1	"
55° 00 N.-"	35.	55 27	"	" 29, '14	19 18° 3	"
45° 00 W.-"	31.	56 27	"	" 7, '14	24° 5	"
60° 00 S.-"	28.	56 27	"	" 8, '14	16 04° 4	"
40° 00 N.-"	20.	56 27	"	" 13, '14	17 51° 1	"



## SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—*Continued.*Table I.—Declination Observations.—*Continued.*

Place.		Township.	Range.	Meridian.	Date.	Declination.	Observer.
At	NE. cor. sec. 21	56	27	Pr.	Oct. 14, '14	14 50.9	J. S. Galletly.
At	" 28	56	27	"	" 15, '14	17 47.0	"
At	" 27	56	27	"	" 16, '14	18 29.0	"
At	" 23	56	27	"	" 26, '14	30.8	"
30 00 W.-	" 10	56	27	"	" 31, '14	17 27.5	"
68 24 E.-	" 36	52	28	"	Nov. 19, '13	19 17.7	T. H. Plunkett.
At	" 12	49	30	"	Jan. 31, '14	19 18.8	P. E. Palmer.
At	" 20	50	30	"	Mar. 12, '14	18 20.9	"
SE	" 5	51	30	"	Feb. 23, '14	17 21.2	"
20.00 N.-	" 5	51	30	"	" 24, '14	16 20.2	"
At	" 1	51	30	"	" 5, '14	17 35.6	"
At	NE. " 12	5	31	"	Sept. 4, '13	16 45.1	A. G. Stuart.
At	" 12	5	31	"	" 4, '13	39.1	"
At	" 12	5	31	"	" 4, '13	16 36.6	"
At	" 12	5	31	"	" 4, '13	41.6	"
16 35 S.-	" 12	6	31	"	" 7, '13	00.2	"
16 35 S.-	" 12	6	31	"	" 7, '13	15 57.7	"
At	" 1	8	31	"	" 10, '13	29.7	"
At	" 1	8	31	"	" 10, '13	34.6	"
At	E. Bdy. sec. 1	9	31	"	" 12, '13	21.2	"
8 09 S.-NE. cor. sec. 36	" 36	10	31	"	" 16, '13	16 00.1	"
8 09 S.-	" 36	10	31	"	" 16, '13	00.7	"
At	" 29	21	31	"	June 16, '14	18 10.0	R. C. Purser.
40 00 E.-	" 29	21	31	"	" 16, '14	17 59.9	"
20 00 W.-	" 36	50	31	"	Jan. 16, '14	16 42.4	P. E. Palmer.
96 00 W.-	" 36	50	31	"	" 17, '14	17 21.2	"
56 75 W.-	" 32	4	1	2	June 12, '14	16 16.3	A. G. Stuart.
36 00 N.-	" 32	48	1	2	" 18, '13	19 09.4	P. E. Palmer.
36 00 N.-	" 32	48	1	2	" 24, '13	07.4	"
40 00 S.-	" 28	48	1	2	July 2, '13	24.8	"
61 64 S.-	" 18	48	1	2	Aug. 18, '13	43.5	"
22 52 W.-	" 8	48	1	2	" 20, '13	20 30.5	"
22 17 S.-	" 6	48	1	2	" 21, '13	19 44.8	"
At NE.	" 8	49	1	2	June 26, '13	46.0	"
6 35 N.-	" 3	50	1	2	Aug. 11, '13	07.2	"
22 00 E.-	" 11	50	1	2	" 12, '13	15.0	"
16 40 E.-	" 31	60	1	2	June 9, '14	20 27.4	E. S. Martindale.
22 50 E.-	" 33	60	1	2	" 10, '14	19 20.3	"
8 00 N.-	" 13	68	1	2	Jan. 6, '13	20 20.0	E. W. Robinson.
33 00 N.-	" 25	68	1	2	" 18, '13	19 35.0	"
58 57 N.-	" 1	69	1	2	" 21, '13	20 11.9	"
63 35 N.-	" 12	69	1	2	" 22, '13	27.6	"
20 55 N.-	" 24	69	1	2	" 24, '13	19 50.0	"
41 22 N.-	" 25	69	1	2	" 25, '13	20 21.7	"
13 16 N.-	" 1	70	1	2	Feb. 4, '13	20 32.7	"
49 66 N.-	" 1	70	1	2	" 5, '13	41.8	"
37 77 N.-	" 12	70	1	2	" 6, '13	21 01.8	"
31 75 N.-	" 25	70	1	2	" 8, '13	19 31.6	"
14 17 N.-	" 36	70	1	2	" 10, '13	21 22.3	"
67 24 N.-	" 36	70	1	2	" 11, '13	18 50.0	"
61 39 N.-	" 13	71	1	2	" 15, '13	20 15.2	"
41 97 N.-	" 24	71	1	2	" 17, '13	30.9	"
8 55 N.-	" 25	71	1	2	" 18, '13	21 30.1	"
64 03 N.-	" 25	71	1	2	" 19, '13	47.1	"
12 34 N.-	" 1	72	1	2	" 21, '13	20 16.2	"
22 96 N.-	" 12	72	1	2	" 22, '13	22 50.5	"
78 16 N.-	" 12	72	1	2	" 24, '13	20 15.5	"
42 14 N.-	" 24	72	1	2	" 25, '13	23 39.5	"
7 67 N.-	" 25	72	1	2	" 27, '13	20 41.7	"
12 94 N.-	" 36	72	1	2	" 28, '13	21 56.0	"
55 75 N.-	" 13	73	1	2	Mar. 3, '13	22 43.3	"
27 59 N.-	" 25	73	1	2	" 4, '13	15.0	"
76 97 N.-	" 36	73	1	2	" 6, '13	23 52.1	"
77 83 N.-	" 12	74	1	2	" 8, '13	25 06.8	"



## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
54° 24' N.-NE. cor. sec. 36.	74	1	2	Mar. 11, '13	29 57.5	E. W. Robinson.
60° 27' N. " 1	74	1	2	" 7, '13	22 21.7	"
37° 30' N. " 1	75	1	2	" 12, '13	25.1	"
46° 20' N. " 12	75	1	2	" 13, '13	21 25.6	"
80° 32' N. " 12	75	1	2	" 14, '13	20.0	"
8° 00' N. " 24	75	1	2	" 15, '13	20 46.5	"
25° 72' N. " 25	75	1	2	" 17, '13	45.8	"
7° 50' N. " 1	76	1	2	" 18, '13	51.1	"
11° 74' N. " 12	76	1	2	" 19, '13	44.8	"
13° 57' N. " 13	76	1	2	" 20, '13	35.7	"
31° 55' N. " 24	76	1	2	" 22, '13	44.2	"
28° 10' N. " 36	76	1	2	" 24, '13	52.2	"
65° 82' N. " 1	77	1	2	" 26, '13	48.6	"
40° 00' N. " 24	77	1	2	" 27, '13	40.8	"
50° 00' N. " 25	77	1	2	Apr. 1, '13	51.3	"
11° 00' W. " 13	78	1	2	" 4, '13	21 07.3	"
9° 00' N. " 12	79	1	2	" 11, '13	20 36.5	"
*22° 00' N. " 1	80	1	2	" 16, '13	21 05.0	"
34° 00' N. " 12	81	1	2	" 23, '13	20 45.0	"
6° 00' N. " 13	82	1	2	" 29, '13	50.7	"
47° 00' N. " 1	83	1	2	May 3, '13	21 13.5	"
69° 00' N. " 12	83	1	2	May 5, '13	19 41.2	"
57° 00' N. " 13	83	1	2	May 7, '13	20 49.1	"
25° 09' N. " 36	84	1	2	May 10, '13	20 54.2	"
12° 00' N. " 1	85	1	2	May 12, '13	21 49.8	"
46° 50' W. " 35	4	2	2	June 12, '14	16 23.3	A. G. Stuart.
46° 50' W. " 35	4	2	2	June 12, '14	25.2	"
27° 70' W. " 34	47	2	2	Aug. 25, '13	19 35.4	P. E. Palmer.
69° 00' E. " 23	47	2	2	Sept. 19, '13	01.7	"
6° 00' W. " 7	47	2	2	" 27, '13	45.4	"
26° 66' E. " 9	47	2	2	" 30, '13	28.5	"
16° 00' S. " 5	47	2	2	Oct. 2, '13	31.0	"
50° 95' S. " 24	48	2	2	Aug. 26, '13	18 50.2	"
7° 87' W. " 11	48	2	2	" 19, '13	19 24.2	"
24° 00' N. " 12	49	2	2	July 4, '13	34.4	"
11° 70' E. " 34	60	2	2	June 1, '14	53.3	E. S. Martindale.
41° 72' W. " 33	4	3	2	" 15, '14	17 01.8	A. G. Stuart.
41° 72' W. " 33	4	3	2	" 15, '14	02.2	"
62° 68' N. " 3	46	3	2	Oct. 11, '13	19 44.3	P. E. Palmer.
44° 32' N. " 4	46	3	2	" 13, '13	31.1	"
12° 53' S. " 24	47	3	2	Sept. 26, '13	34.0	"
76° 75' W. " 11	47	3	2	Oct. 8, '13	14.8	"
At SE. " 1	47	3	2	" 9, '13	17.3	"
12° 00' W. " 3	47	3	2	Dec. 19, '13	41.3	"
41° 00' S.-NE. " 25	48	3	2	Aug. 30, '13	18 12.6	"
77° 50' S. " 13	48	3	2	Sept. 2, '13	17 37.8	"
At S. " 36	48	3	2	Aug. 29, '13	35.6	"
16° 40' N. " 13	48	3	2	Sept. 1, '13	34.0	"
58° 40' E. " 31	60	3	2	May 19, '14	21 14.6	E. S. Martindale.
13° 50' W. " 35	4	4	2	June 16, '14	17 58.0	A. G. Stuart.
13° 50' W. " 35	4	4	2	June 16, '14	56.0	"
43° 00' S. " 13	47	4	2	Dec. 9, '13	19 51.3	P. E. Palmer.
22° 52' W. " 35	4	5	2	June 17, '14	19 03.0	A. G. Stuart.
15° 50' E. " 35	60	5	2	May 13, '14	50.4	E. S. Martindale.
57° 01' W. " 34	4	6	2	June 18, '14	18 08.6	A. G. Stuart.
57° 01' W. " 34	4	6	2	" 18, '14	09.4	"
20° 26' E. " 36	60	6	2	Apr. 30, '14	20 40.9	E. S. Martindale.
53° 15' W. " 36	4	7	2	June 19, '14	17 50.5	A. G. Stuart.
At " 35	4	9	2	" 22, '14	45.5	"
74° 72' W. " 31	4	10	2	" 24, '14	55.2	"
74° 72' W. " 31	4	10	2	" 24, '14	56.3	"
At " 27	48	10	2	Oct. 8, '14	19 45.9	J. H. McKnight.
At " 33	48	10	2	Apr. 9, '13	15 59.4	G. J. Lonergan.
67° 41' W. " 36	4	11	2	June 24, '14	17 57.1	A. G. Stuart.



## SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—*Continued.*Table I.—*Declination Observations.*—Continued.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
60° 00 W.-NE. cor. sec. 9	26	11	2	Sept. 16, '14	19 02.6	W. A. Fletcher.
50° 00 W. } " 26	26	11	2	" 23, '14	03.2	"
45 00 S. } " 36	4	12	2	June 25, '14	18 21.2	A. G. Stuart.
77° 00 W. } " 21	25	12	2	July 4, '14	57.2	W. A. Fletcher.
41° 50 N. } " 9	26	12	2	Sept. 10, '14	19 11.1	"
At " 21	31	12	2	Aug. 31, '14	32.6	J. H. McKnight.
40° 00 N. } " 11	32	12	2	Sept. 5, '14	32.4	"
At " 14	33	12	2	Aug. 20, '14	08.7	"
22° 70 N. } " 31	60	12	2	Mar. 22, '14	21 27.9	E. S. Martindale.
12° 00 E. } " 9	25	13	2	July 21, '14	19 21.6	W. A. Fletcher.
41° 00 N. } " 26	13	2	2	Aug. 31, '14	17.2	"
40° 00 N. } " 26	13	2	2	" 30, '14	11.2	"
40° 00 W. } SE. cor. sec. 3	27 <sup>a</sup>	13	2	" 20, '14	17.0	"
At NE. cor. sec. 16	27	13	2	Oct. 5, '14	17.3	"
41° 50 N. } " 21	27	13	2	" 14, '14	17.0	"
41° 00 E. } " 20	25	14	2	July 23, '14	39.6	"
At " 21	26	14	2	" 26, '14	26.8	"
10° 50 N. } " 4	27 <sup>a</sup>	14	2	Aug. 9, '14	22.8	"
64° 67 E.-NE. cor. sec. 36	60	14	2	Mar. 17, '14	21 31.3	E. S. Martindale.
64° 67 E. } " 36	60	14	2	" 17, '14	28.0	"
20° 00 W. } " 8	37	15	2	Sept. 19, '14	19 44.7	J. H. McKnight.
7° 00 N. } " 36	37	15	2	" 26, '14	20 20.3	"
10° 82 W. } " 35	60	15	2	Mar. 11, '14	20 33.5	E. S. Martindale.
10° 82 W. } " 35	60	15	2	" 11, '14	25.1	"
75° 0 W. } " 36	4	16	2	July 1, '14	18 15.5	A. G. Stuart.
At " 11	37	16	2	Aug. 6, '14	19 58.7	J. H. McKnight.
40° 00 S. } " 29	37	16	2	" 8, '14	56.0	"
64° 37 E. } " 33	60	16	2	Feb. 28, '14	22 24.2	E. S. Martindale.
20° 70 E. } " 35	60	16	2	Mar. 2, '14	21 42.7	"
20° 70 E. } " 35	60	16	2	" 3, '14	43.5	"
20° 70 E. } " 35	60	16	2	" 3, '14	43.7	"
45° 14 E. } " 35	60	16	2	" 5, '14	28.9	"
40° 00 W. } " 34	4	17	2	July 2, '14	18 05.1	A. G. Stuart.
15° 00 N.-SE } " 1	35	17	2	June 13, '14	19 55.2	J. H. McKnight.
37° 00 W. } " 1	35	17	2	" 15, '14	54.3	"
29° 00 W.-NE } " 11	35	17	2	" 16, '14	20 12.8	"
33° 00 W. } " 20	35	17	2	" 19, '14	19 43.0	"
40° 00 N. } " 16	37	17	2	July 29, '14	20 00.0	"
26° 94 E. } " 31	60	17	2	Feb. 17, '14	22 19.2	E. S. Martindale.
59° 23 E. } " 36	60	17	2	" 25, '14	38.6	"
20° 00 W. } " 36	4	18	2	July 3, '14	18 11.1	A. G. Stuart.
32° 00 N. } " 1	33	18	2	Sept. 15, '14	20 16.3	J. H. McKnight.
31° 20 W. } " 20	36	18	2	June 29, '14	19 56.3	"
At " 17	37	18	2	" 30, '14	58.5	"
65° 50 W. } " 20	38	18	2	July 15, '14	54.4	"
63° 00 W. } " 8	38	18	2	" 16, '14	46.3	"
46° 60 N. } " 12	38	18	2	" 24, '14	59.6	"
17° 00 S. } " 5	40	18	2	June 11, '14	31.3	R. C. Purser.
36° 83 S. } " 5	40	18	2	" 12, '14	27.4	"
1° 47 E. } " 35	60	18	2	Feb. 10, '14	24 39.7	E. S. Martindale.
52° 50 E. } " 35	60	18	2	" 13, '14	23 59.5	"
7° 99 W. } " 35	4	19	2	July 6, '14	18 14.6	A. G. Stuart.
At station 4, sec. 28	4	19	2	" 5, '14	46.5	C. Rinfret.
" 4, " 28	4	19	2	" 6, '14	40.5	"
" 4, " 28	4	19	2	" 9, '14	46.1	"
Sta. 4, Traverse MacDonald L sec. 19	5	19	2	" 14, '14	54.1	"
" " 19	5	19	2	" 17, '14	49.1	"
" " 19	5	19	2	" 18, '14	47.5	"
At station 2, sec. 4	6	19	2	" 19, '14	13.0	"
" 2, " 4	6	19	2	" 19, '14	27.4	"
" 2, " 4	6	19	2	" 20, '14	34.2	"
" 2, " 4	6	19	2	" 22, '14	14.2	"







## SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—*Continued.*Table I.—Declination Observations.—*Continued.*

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
68° 72' E.-NE cor. sec. 34	60	25	2	Oct. 8, '13	39° 4	E. S. Martindale.
At NE " 35	4	26	2	July 17, '14	18 51° 9	A. G. Stuart.
40° 00' E. " 20	39	26	2	Aug. 26, '14	21 28° 3	R. Neelands.
At Centre sec. 24	39	26	2	Sept. 14, '14	39° 5	"
At NE. cor. sec. 10	41	26	2	" 20, '14	19 38° 3	"
40° 00' S. " 11	49	26	2	Jan. 2, '14	22 26° 6	"
35° 3' N. " 1	49	26	2	" 9, '14	23 02° 2	"
6° 99' E. " 33	60	26	2	Oct 9, '13	17° 8	E. S. Martindale.
6° 99' E. " 33	60	26	2	" 11, '13	22 57° 3	"
At Sta. 4 sec 22	12	27	2	Oct. 14, '14	19 56° 9	C. Rinfret.
" 22	12	27	2	" 11, '14	51° 7	"
" 22	12	27	2	" 14, '14	54° 3	"
65° 00' S.-NE. cor. sec. 11	18	27	2	July 5, '14	58° 4	B. H. Segre.
65° 00' S. " 11	18	27	2	" 5, '14	20 04° 4	"
65° 00' S. " 11	18	27	2	" 5, '14	06° 2	"
65° 00' S. " 30	19	27	2	" 19, '14	12° 9	"
65° 00' S. " 30	19	27	2	" 19, '14	11° 8	"
65° 00' S. " 32	25	27	2	Oct. 17, '14	38° 6	R. C. Purser.
At Centre " 4	46	27	2	June 13, '14	22 42° 0	R. Neelands.
0° 50' E.-NE " 33	56	27	2	July 15, '13	23 08° 2	E. S. Martindale.
47° 26' P. " 34	56	27	2	" 17, '13	17° 6	"
16° 65' E. " 35	56	27	2	" 18, '13	23° 3	"
19° 97' E. " 36	56	27	2	" 23, '13	27° 5	"
67° 58' E. " 36	60	27	2	Oct. 10, '13	28° 9	"
71° 00' W. " 31	4	28	2	July 20, '14	19 35° 3	A. G. Stuart.
71° 00' W. " 31	4	28	2	" 20, '14	36° 5	"
24° 95' Bear 105° 42' NE cor. sec. 24	7	28	2	Sept. 2, '14	31° 5	C. Rinfret.
24° 95' " " 24	7	28	2	" 3, '14	29° 9	"
24° 95' " " 24	7	28	2	" 3, '14	28° 3	"
35° 00' S.-NE cor. sec. 15	18	28	2	July 12, '14	43° 5	B. H. Segre.
35° 00' S. " 15	18	28	2	" 13, '14	46° 8	"
35° 00' S. " 15	18	28	2	" 13, '14	46° 5	"
40° 00' S. " 21	41	28	2	Aug. 15, '14	21 34° 8	R. Neelands.
Centre NE $\frac{1}{4}$ sec 14	42	28	2	" 5, '14	43° 1	"
12° 00' E.-NE cor. sec. 35	43	28	2	July 14, '14	20 53° 1	"
12° 00' N. " 22	44	28	2	" 10, '14	23 50° 3	"
Sta. 2 Traverse Shallow lake sec 1	7	29	2	Sept. 3, '14	19 52° 0	C. Rinfret.
" " " 1	7	29	2	" 4, '14	19 49° 4	"
" " " 1	7	29	2	" 4, '14	52° 4	"
5° 00' N.-NE cor. sec. 34	17	29	2	Aug. 2, '14	47° 1	B. H. Segre.
10° 00' W. " 36	19	29	2	July 22, '14	20 11° 8	"
10° 00' W. " 36	19	29	2	" 26, '14	17° 7	"
10° 00' W. " 36	19	29	2	" 26, '14	14° 9	"
48° 20' bear. 133° 51' N.E. cor. sec. 32	5	1	3	Sept. 28, '14	19 33° 8	C. Rinfret.
48° 20' " 133° 51' " 32	5	1	3	" 28, '14	36° 0	"
48° 20' " 133° 51' " 32	5	1	3	" 29, '14	29° 6	"
Sta. 3 Twelve mile lake sec. 10	6	1	3	" 10, '14	44° 5	"
55° 00' S.-N.E. cor. sec. 10	14	1	3	July 18, '14	22 11° 6	G. C. Cowper.
10° 00' N. " 5	14	1	3	" 19, '14	10° 1	"
9° 00' W. " 5	14	1	3	" 19, '14	09° 9	"
18° 00' N. " 36	68	1	3	" 3, '13	23 33° 3	A. Saint Cyr.
1° 00' N. " 13	69	1	3	" 13, '13	19° 6	"
1° 00' N. " 13	69	1	3	" 13, '13	02° 2	"
33° 00' N. " 36	69	1	3	" 30, '13	29° 1	"
72° 00' N. " 13	70	1	3	Aug. 10, '13	33° 2	"
18° 00' N. " 24	70	1	3	" 14, '13	22 22° 9	"
18° 00' N. " 24	70	1	3	" 14, '13	23° 9	"
62° 00' N. " 1	71	1	3	" 19, '13	46° 3	"
58° 00' N. " 13	71	1	3	" 26, '13	23 39° 5	"
48° 00' N. " 25	71	1	3	" 28, '13	22° 2	"
48° 00' N. " 25	71	1	3	" 28, '13	14° 8	"
40° 00' N. " 24	72	1	3	Sept. 3, '13	22 57° 0	"
40° 00' N. " 24	72	1	3	" 5, '13	23 05° 1	"



## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
34° 00' W.-N.E. cor. sec. 34.	72	1	3	Sept. 13, '13	21 28.5	A. Saint Cyr.
34° 00' W. " 34.	72	1	3	" 14, '13	57.7	"
41° 00' W. " 32.	72	1	3	" 22, '13	22 22.0	"
41° 00' W. " 32.	72	1	3	" 23, '13	29.5	"
41° 00' W. " 32.	72	1	3	" 24, '13	21 56.2	"
At " 36.	4	2	3	July 24, '14	19 36.1	A. G. Stuart.
At " 36.	4	2	3	" 24, '14	35.8	"
Sta. 37 Twelve mile lake sec. 22.	6	2	3	Sept. 16, '14	55.8	C. Rinfret.
" 37 " " 22.	6	2	3	" 16, '14	20 03.2	"
" 37 " " 22.	6	2	3	" 16, '14	19 55.4	"
24° 00' W.-N.E. cor. sec. 36.	72	2	3	" 30, '13	22 23.0	A. Saint Cyr.
44° 00' W. " 36.	72	2	3	" 30, '13	14.1	"
44° 00' W. " 36.	72	2	3	Oct. 2, '13	24.0	"
65° 00' W. " 36.	72	2	3	" 4, '13	21 48.1	"
65° 00' W. " 36.	72	2	3	" 4, '13	45.7	"
40° 00' W. " 34.	72	2	3	" 10, '13	23 34.6	"
61° 00' W. " 34.	72	2	3	" 11, '13	24 24.4	"
61° 00' W. " 33.	72	2	3	" 15, '13	37.3	"
75° 00' W. " 31.	72	2	3	" 22, '13	22 46.8	"
20° 30' bear. 109° 11' N.E. cor. sec. 36.	5	3	3	Sept. 27, '14	20 05.3	C. Rinfret.
20° 30' " 109° 11' " 36.	5	3	3	" 28, '14	04.7	"
Twelve mile lake sec. 27	6	3	3	" 22, '14	19 24.6	"
" " " " " " " " " " " "	6	3	3	" 23, '14	39.8	"
" " " " " " " " " " " "	6	3	3	" 23, '14	24.6	"
37° 00' W.-N.E. cor. sec. 12.	14	3	3	July 30, '14	20 52.1	R. C. Purser.
At " 18.	22	3	3	Sept. 30, '14	49.4	B. H. Segre.
At " 18.	22	3	3	Oct. 5, '14	56.1	"
At " 18.	22	3	3	" 5, '14	55.5	"
11° 00' W. " 34.	72	3	3	Nov. 4, '13	23 56.7	A. Saint Cyr.
30° 00' W. " 34.	72	3	3	" 5, '13	03.8	"
30° 00' W. " 34.	72	3	3	" 10, '13	29.4	"
20° 00' W. " 31.	72	3	3	" 14, '13	32.8	"
70° 00' W. " 31.	72	3	3	" 15, '13	24 59.4	"
At " 35.	4	4	3	July 27, '14	18 56.2	A. G. Stuart.
At " 35.	4	4	3	" 27, '14	53.0	"
5° 00' E. " 7.	19	4	3	Sept. 22, '14	21 09.4	B. H. Segre.
20° 00' S. " 19.	20	4	3	Aug. 15, '14	18.4	"
20° 00' S. " 19.	20	4	3	" 15, '14	21 14.7	"
At " 19.	20	4	3	Sept. 23, '14	06.1	"
8° 00' W. " 36.	72	4	3	Nov. 15, '13	23 25.5	A. Saint Cyr.
14° 00' W. " 34.	72	4	3	" 19, '13	48.9	"
33° 00' W. " 33.	72	4	3	" 21, '13	24 28.2	"
80° 00' W. " 33.	72	4	3	" 21, '13	27.4	"
40° 00' W. " 31.	72	4	3	" 25, '13	05.3	"
40° 00' W. " 35.	72	5	3	" 28, '13	25 35.9	"
10° 00' W. " 34.	72	5	3	" 29, '13	22.4	"
10° 00' W. " 31.	72	5	3	" 29, '13	24 22.1	"
25° 00' W. " 33.	72	5	3	Dec. 2, '13	56.1	"
25° 00' W. " 35.	72	5	3	" 2, '13	25.5	"
51° 00' W. " 33.	72	5	3	" 4, '13	35.8	"
71° 00' W. " 32.	72	5	3	" 4, '13	18.1	"
46° 00' W. " 31.	4	6	3	Aug. 1, '14	21 20.2	A. G. Stuart.
52° 00' W. " 31.	72	6	3	Dec. 12, '13	24 15.9	A. Saint Cyr.
12° 00' W. " 33.	72	6	3	" 13, '13	25 31.5	"
38° 00' W. " 33.	72	6	3	" 13, '13	24 05.2	"
60° 00' W. " 33.	72	6	3	" 15, '13	25 47.8	"
25° 00' W. " 32.	72	6	3	" 15, '13	24 42.6	"
*Sta. 4 S. Sask. R.	22	7	3	Sept. 6, '14	21 47.1	B. H. Segre.
" 4 " " " " " " " " " "	22	7	3	" 6, '14	40.3	"
15° 00' N.-N.E. cor. sec. 3.	53	7	3	Oct. 13, '14	23 09.3	R. Neelands.
36° 00' W. " 36.	72	7	3	Dec. 19, '13	25 49.9	A. Saint Cyr.
1° 00' W. " 35.	72	7	3	" 19, '13	24 58.3	"
39° 00' W. " 35.	72	7	3	" 20, '13	26 09.2	"
12° 00' W. " 34.	72	7	3	" 20, '13	15.1	"



## SESSIONAL PAPER No. 25b

## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
52° 00 W.-NE. cor. sec. 34.	72	7	3	Dec. 23, '13	18° 5'	A. Saint Cyr.
81° 00 W.-" 34.	72	7	3	" 23, '13	11° 0'	"
81° 00 W.-" 34.	72	7	3	" 26, '13	25 33° 0'	"
27° 50 W.-" 33.	72	7	3	" 26, '13	26 07° 9'	"
At " 32.	72	7	3	" 27, '13	27 39° 7'	"
39° 00 W.-" 32.	72	7	3	" 27, '13	07° 2'	"
9° 00 W.-" 31.	72	7	3	" 29, '13	26 35° 4'	"
9° 00 W.-" 31.	72	7	3	" 29, '13	27° 5'	"
10° 00 W.-" 8.	13	8	3	Sept. 24, '14	21 40° 0'	G. C. Cowper.
32° 00 S.-" 18.	14	8	3	" 21, '14	20 01° 1'	"
5° 00 N.-" 18.	24	8	3	" 28, '14	21 29° 1'	S. L. Evans.
10° 00 N.-" 8.	26	8	3	Oct. 8, '14	21 34° 6'	"
15° 00 S.-" 16.	26	8	3	" 16, '14	23° 8'	"
28° 00 W.-" 34.	72	8	3	Jan. 5, '14	25 41° 3'	A. Saint Cyr.
28° 00 W.-" 33.	72	8	3	" 6, '14	26 09° 2'	"
68° 00 W.-" 33.	72	8	3	" 6, '14	29° 0'	"
74° 00 W.-" 31.	72	8	3	" 16, '14	25 47° 0'	"
50° 00 W.-" 34.	4	9	3	Aug. 3, '14	20 52° 7'	A. G. Stuart.
50° 00 W.-" 34.	4	9	3	" 3, '14	21 25° 7'	"
At " 31.	12	9	3	Sept. 22, '14	12° 1'	G. C. Cowper.
20° 00 N.-" 9.	21	9	3	Aug. 14, '14	56° 6'	R. C. Purser.
0° 50 S.-" 26.	24	9	3	Sept. 26, '14	43° 5'	S. L. Evans.
36° 00 S.-" 25.	24	9	3	" 28, '14	29° 6'	"
11° 00 W.-" 36.	72	9	3	Jan. 16, '14	25 59° 0'	A. Saint Cyr.
43° 00 W.-" 36.	72	9	3	" 17, '14	53° 3'	"
72° 00 W.-" 36.	72	9	3	" 17, '14	26 01° 2'	"
40° 00 S.-" 29.	13	10	3	Sept. 19, '14	21 04° 9'	G. C. Cowper.
7° 00 N.-" 18.	26	10	3	Oct. 13, '14	39° 8'	S. L. Evans.
0° 50 N.-" 14.	26	10	3	" 14, '14	22 02° 5'	"
1° 00 S.-" 11.	26	10	3	" 14, '14	00° 3'	"
At " 36.	72	10	3	Jan. 27, '14	26 58° 4'	A. Saint Cyr.
At " 36.	72	10	3	" 27, '14	27 03° 1'	"
0° 50 E.-" 24.	26	11	3	Oct. 12, '14	21 46° 2'	S. L. Evans.
54° 00 W.-" 34.	72	11	3	Feb. 11, '14	27 21° 5'	A. Saint Cyr.
9° 00 W.-" 33.	72	11	3	" 12, '14	57° 4'	"
79° 00 W.-" 33.	72	11	3	" 12, '14	21° 4'	"
31° 00 N.-" 35.	11	12	3	Sept. 6, '14	21 07° 6'	G. C. Cowper.
31° 00 E.-" 23.	39	12	3	" 18, '14	23 50° 6'	R. C. Purser.
At " 23.	39	12	3	" 19, '14	48° 7'	"
At " 26.	39	12	3	" 19, '14	45° 0'	"
80° 00 W.-" 36.	72	12	3	Feb. 17, '14	26 16° 1'	A. Saint Cyr.
49° 00 W.-" 35.	72	12	3	" 18, '14	25 29° 5'	"
13° 00 W.-" 34.	72	12	3	" 19, '14	23° 8'	"
11° 00 W.-" 31.	72	12	3	" 25, '14	26 26° 6'	"
At " 13.	13	13	3	Sept. 17, '14	21 19° 0'	G. C. Cowper.
30° 00 S.-" 32.	29	13	3	" 7, '14	22° 5'	R. C. Purser.
1-4 cor. E. by sec. 24.	39	13	3	" 16, '14	24 04° 5'	"
1-4 " 1.	39	13	3	" 23, '14	23 59° 7'	"
61° 00 S.-NE. cor. sec. 21.	39	13	3	May 22, '14	55° 1'	S. L. Evans.
36° 00 S.-" 15.	39	13	3	" 26, '14	44° 7'	"
0° 50 E.-SE. " 2.	39	13	3	June 16, '14	54° 9'	"
5° 00 S.-NE. " 23.	39	13	3	May 29, '14	57° 5'	"
56° 00 S.-" 14.	39	13	3	" 30, '14	24 00° 0'	"
77° 00 S.-" 24.	39	13	3	June 3, '14	23 58° 5'	"
20° 00 S.-" 29.	39	13	3	July 21, '14	24 02° 8'	"
49° 50 S.-" 20.	39	13	3	" 22, '14	05° 0'	"
12° 00 W.-" 20.	39	13	3	" 25, '14	04° 8'	"
3° 00 W.-" 36.	72	13	3	Feb. 26, '14	26 00° 3'	A. Saint Cyr.
70° 00 W.-" 34.	72	13	3	Mar. 3, '14	25 55° 6'	"
61° 00 W.-" 32.	72	13	3	" 4, '14	25 27° 3'	"
30° 00 W.-" 23.	74	13	3	" 9, '14	26 01° 0'	"
30° 00 W.-" 32.	4	14	3	Aug. 11, '14	20 01° 7'	A. G. Stuart.
1° 00 N.-" 7.	38	14	3	July 8, '14	23 45° 9'	E. P. Bowman.



## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
40°00 S.-NE. cor. sec. 1	39	14	3	July 23, '14	23 54.0	E. P. Bowman.
0.04 W.-	27	39	3	" 23, '14	24 13.0	"
At	31	39	3	Aug. 5, '14	23 48.3	"
At	31	39	3	" 15, '14	24 00.9	"
38°00 W.-	36	72	3	Mar. 7, '14	26 29.5	A. Saint Cyr.
69°00 W.-	35	72	3	" 9, '14	06.5	"
At	32	72	3	" 10, '14	10.5	"
36°00 W.-	31	4	3	Aug. 12, '14	20 09.8	A. G. Stuart.
36°00 W.-	31	4	3	" 12, '14	08.7	"
31°00 N.-	35	11	3	Sept. 3, '14	21 13.8	G. C. Cowper.
31°00 E.-						
4°50 E.-	15	14	3	" 9, '14	13.0	"
5°00 S.-						
30°00 S.-	26	19	3	Oct. 9, '14	59.7	R. C. Purser.
20°00 S. $\frac{1}{4}$ E. by sec 31						
40°00 W.-NE. cor. sec. 31	35	15	3	Aug. 26, '14	22 11.4	"
At	23	37	3	Oct. 14, '14	23 55.9	G. A. Bennett
40°00 S.-	14	38	3	July 4, '14	43.6	E. P. Bowman.
At	19	39	3	" 13, '14	24 08.1	"
20°00 W.-	24	71	3	Aug. 26, '14	23 00.9	"
20°00 W.-	24	71	3	Mar. 15, '14	24 24.8	A. Saint Cyr.
20°00 W.-	24	71	3	" 18, '14	31.9	"
20°00 W.-	24	71	3	" 26, '14	27.8	"
20°00 W.-	24	71	3	" 27, '14	38.0	"
20°00 W.-	24	71	3	" 27, '14	41.0	"
50°00 W.-	36	72	3	" 13, '14	25 53.2	"
40°00 W.-	34	72	3	" 14, '14	26 13.6	"
At	32	72	3	" 17, '14	27 21.9	"
24°50 W.-	31	72	3	" 18, '14	21.1	"
40°00 S.-	34	37	3	June 22, '14	24 12.1	E. P. Bowman.
At	36	37	3	July 1, '14	41.2	"
42°50 E.-	7	40	3	Aug. 27, '14	25 20.3	"
At	35	72	3	Mar. 29, '14	27 29.2	A. Saint Cyr.
40°00 W.-	33	72	3	" 21, '14	22.7	"
1°00 N.-	1	39	3	June 11, '14	24 34.5	E. P. Bowman.
2°00 N.-	18	40	3	Sept. 3, '14	23 51.6	"
8°00 W.-	36	72	3	" 24, '14	27 19.1	A. Saint Cyr.
40°00 W.-	35	72	3	" 25, '14	26 51.6	"
18°00 W.-	34	72	3	" 26, '14	27 10.4	"
40°00 W.-	33	72	3	" 28, '14	12.1	"
30°00 W.-	31	4	3	Aug. 15, '14	21 18.5	A. G. Stuart.
16°00 N.-	35	9	3	Aug. 29, '14	07.6	G. C. Cowper.
12°00 E.-						
At	36	12	3	Aug. 26, '14	29.7	"
30°00 N.-	24	35	3	Oct. 1, '14	24 10.1	G. A. Bennett.
12°00 N.-	5	13	3	Aug. 16, '14	21 45.2	G. C. Cowper.
10°00 E.-	35	13	3	" 25, '14	35.8	"
20°50 S.-	34	14	3	" 20, '14	22 17.3	"
23°00 E.-						
11°50 S.-	3	23	3	Oct. 13, '14	31.0	z
31°00 W.-						
49°00 S.-	9	23	3	" 17, '14	27.3	"
12°00 W.-						
20°00 E.-	8	8	3	Aug. 9, '14	21 34.4	"
55°00 S.-	32	9	3	" 10, '14	35.7	"
9°00 W.-						
25°00 N.-	25	31	3	" 31, '14	35.0	G. A. Bennett.
20°00 S.-	22	34	3	Sept. 28, '14	22 49.6	"
$\frac{1}{4}$ on E by sec.	32	36	3	Aug. 7, '14	22 40.5	R. C. Purser.
0°57 E.-NE. cor. sec. 33	33	47	3	Sept. 30, '14	25 33.9	"
5°00 N.-	32	15	3	Aug. 26, '14	24 05.9	S. L. Evans
0°50 N.-	9	16	3	" 24, '14	23 03.0	"
1°50 S.-	12	16	3	" 25, '14	21 45.2	"
3°50 N.-	11	16	3	" 25, '14	37.7	"



## SESSIONAL PAPER No. 25b

## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
0°50 N.-NE. cor. sec. 10.	16	21	3	Aug. 25, '14	28°6	S. L. Evans.
78°00 S.	16	21	3	" 26, '14	23 24.2	"
5°00 N.	16	21	3	" 27, '14	21 43.0	"
5°00 N.	16	21	3	" 27, '14	38.1	"
5°00 N.	16	21	3	" 27, '14	22 20.3	"
9°00 W.	16	21	3	" 27, '14	39.6	"
52°00 W.	16	21	3	" 27, '14	23 45.9	"
20°00 W.	31	35	21	Sept. 20, '14	35.4	G. A. Bennett.
At	12	63	21	Jan. 27, '14	27 50.6	A. L. Cumming.
6°75 S.	5	31	22	Aug. 24, '14	24 09.9	G. A. Bennett.
*35°00 W.	26	31	22	" 27, '14	23 59.6	"
*35°00 W.	26	31	22	" 27, '14	57.0	"
*35°00 W.	26	31	22	" 27, '14	57.5	"
*35°00 W.	26	31	22	" 27, '14	58.5	"
*35°00 W.	26	31	22	" 27, '14	56.6	"
*35°00 W.	26	31	22	" 27, '14	56.2	"
*35°00 W.	26	31	22	" 27, '14	58.2	"
*35°00 W.	26	31	22	" 27, '14	57.5	"
*35°00 W.	26	31	22	" 27, '14	55.9	"
*35°00 W.	26	31	22	" 27, '14	59.5	"
*35°00 W.	26	31	22	" 17, '14	24 00.1	"
*35°00 W.	26	31	22	" 27, '14	22 57.5	"
*35°00 W.	26	31	22	" 27, '14	56.8	"
35°00 W.	26	31	22	" 27, '14	57.2	"
35°00 W.	26	31	22	" 27, '14	23 56.5	"
35°00	26	31	22	" 27, '14	57.5	"
35°00	26	31	22	" 27, '14	55.7	"
35°00	26	31	22	" 27, '14	53.3	"
35°00	26	31	22	" 27, '14	54.0	"
35°00	26	31	22	" 27, '14	55.0	"
35°00	26	31	22	" 27, '14	54.5	"
35°00	26	31	22	" 27, '14	54.3	"
35°00	26	31	22	" 27, '14	52.2	"
35°00	26	31	22	" 27, '14	54.1	"
35°00	33	32	22	" 26, '14	03.2	"
*30°00 S.	35	33	22	Sept. 5, '14	11.9	"
At	14	35	22	" 17, '14	52.7	"
24°50 S.	19	36	22	" 15, '14	50.3	"
47°00 S.	8	52	22	Oct. 10, '14	24 52.8	E. P. Bowman.
1°00 W.-SE.	5	23	23	Aug. 30, '14	20 59.4	S. L. Evans.
3°00 W.	3	23	23	Sept. 1, '14	21 02.1	"
5°00 S.	9	23	23	" 1, '14	20 56.6	"
27°00 N.	3	23	23	" 3, '14	21 02.8	"
*4°00 N.	25	23	23	" 5, '14	08.9	"
5°50 S.	19	23	23	" 21, '14	12.0	"
0°25 S.	20	23	23	" 21, '14	09.0	"
2°00 S.	21	23	23	" 21, '14	02.2	"
0°50 S.	23	23	23	" 21, '14	05.0	"
At NW.	31	45	23	Aug. 29, '13	24 45.7	A. L. Cumming.
At	31	45	23	" 29, '13	45.5	"
At	31	45	23	" 29, '13	45.3	"
At NE.	10	45	23	" 25, '13	49.1	"
22°00 S.	10	45	23	" 25, '13	50.3	"
22°00	10	45	23	" 25, '13	49.2	"
At	8	45	23	" 18, '13	24 45.8	"
At	8	45	23	" 18, '13	46.7	"
At	8	45	23	" 18, '13	45.6	"
At	19	48	23	Sept. 18, '13	38.9	"
18°00 S.	19	48	23	" 18, '13	40.1	"
At SE.	4	48	23	" 10, '13	41.9	"
At SE.	4	48	23	" 10, '13	41.8	"
At SE.	4	48	23	" 10, '13	42.9	"
5°00 S.	3	51	23	Oct. 23, '14	41.7	J. M. Coté.
At	22	52	23	" 1, '14	46.4	E. P. Bowman.



## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
41° 00' E.-NE. cor. sec. 8	52	23	3	Oct. 7, '14	45° 8'	E. P. Bowman.
At " 19	28	24	3	June 27, '14	22 45° 2'	G. A. Bennett.
30° 00' N. " 19	28	23	3	July 1, '14	51° 3'	"
1° 00' N. " 30	29	24	3	Aug. 12, '14	24 28° 8'	"
30° 00' S. " 17	51	24	3	Sept. 25, '14	17° 4'	J. M. Coté.
14° 00' S. " 5	51	24	3	" 26, '14	27° 2'	"
8° 00' S. " 18	51	24	3	" 28, '14	25° 8'	"
25° 00' E.-SE " 2	51	24	3	Oct. 6, '14	42° 3'	"
30° 00' E. " 3	51	24	3	" 7, '14	40° 2'	"
30° 00' N. " 1	51	24	3	" 7, '14	37° 1'	"
5° 00' N.-NE " 9	51	24	3	" 28, '14	25° 6'	"
40° 00' W. " 33	51	24	3	Nov. 3, '14	33° 5'	"
20° 00' N. " 22	51	24	3	" 10, '14	28° 5'	"
60° 66' S. " 14	52	24	3	Sept. 20, '14	36° 6'	E. P. Bowman.
0° 50' E. " 31	4	25	3	Aug. 25, '14	21 56° 9'	A. G. Stuart.
*6° 72' W. " 31	4	25	3	" 25, '14	58° 1'	"
8° 00' N.-NE " 10	11	25	3	July 29, '14	22 59° 4'	G. C. Cowper.
40° 00' N. " 17	11	25	3	" 31, '14	23 02° 4'	"
At N. " 9	17	25	3	June 29, '14	22 19° 7'	"
4° 00' E. " 34	29	25	3	Aug. 10, '14	56° 5'	G. A. Bennett.
At E. " 34	30	25	3	" 11, '14	23 04° 4'	"
40° 00' N. " 13	50	25	3	" 13, '14	22 36° 4'	"
45° 60' N. " 7	28	26	3	July 7, '14	53° 8'	"
At N. " 26	29	26	3	Aug. 1, '14	23 55° 4'	"
26° 00' S. " 18	30	26	3	" 5, '14	24 29° 3'	"
43° 32' W. " 31	4	27	3	" 27, '14	22 04° 1'	A. G. Stuart.
43° 32' W. " 31	4	27	3	" 27, '14	03° 9'	"
43° 32' W. " 31	4	27	3	" 27, '14	02° 7'	"
At W. " 15	17	27	3	June 30, '14	45° 7'	G. C. Cowper.
At W. " 15	17	27	3	July 1, '14	44° 6'	"
44° 00' S. " 25	29	27	3	Aug. 5, '14	24 38° 5'	G. A. Bennett.
31° 00' N. " 24	30	27	3	" 4, '14	22° 4'	"
At N. " 16	13	28	3	June 14, '14	22 18° 2'	G. C. Cowper.
49° 00' W. " 16	13	28	3	" 16, '14	21° 2'	"
37° 00' S. " 25	15	28	3	" 26, '14	12° 5'	"
5° 00' S. " 9	17	28	3	July 2, '14	40° 4'	"
10° 25' SW. of Wit. I. P. T. 11, N.-NE	27	28	3	" 10, '14	23 51° 9'	G. A. Bennett.
cor. sec. 22	28	28	3	" 21, '14	24 16° 4'	"
50° 00' S.-NE cor. sec. 31	30	28	3	" 25, '14	23 19° 9'	"
At S. " 7	13	29	3	" 11, '14	22 43° 3'	G. C. Cowper.
28° 50' W. " 21	15	29	3	" 7, '14	23 07° 8'	"
50° 00' S. " 29	17	29	3	" 4, '14	03° 2'	"
35° 00' S. " 21	29	29	3	" 22, '14	51° 0'	G. A. Bennett.
50° 00' S. " 27	29	29	3	" 30, '14	24 08° 8'	"
50° 00' S. " 27	7	1	4	Sept. 6, '14	21 51° 0'	A. G. Stuart.
10° 00' S. " 1	7	1	4	" 6, '14	50° 7'	"
10° 00' S. " 1	7	1	4	" 6, '14	49° 0'	"
10° 06' S. " 1	12	1	4	Dec. 10, '14	54° 1'	M. H. Baker.
At " 34	15	1	4	Oct. 14, '14	23 47° 3'	A. G. Stuart.
5° 00' S. " 36	15	1	4	" 14, '14	46° 3'	"
5° 00' S. " 36	16	1	4	Nov. 15, '14	24° 2'	"
15° 00' S. " 36	16	1	4	Oct. 30, '14	15° 1'	M. H. Baker.
At " 5	16	1	4	" 31, '14	17° 0'	"
20° 00' N. " 28	19	1	4	" 18, '14	29 02° 2'	A. G. Stuart.
10° 00' N. " 13	19	1	4	" 18, '14	28 47° 4'	"
10° 00' N. " 13	19	1	4	" 18, '14	29 01° 1'	"
10° 00' N. " 13	19	1	4	" 18, '14	01° 0'	"
10° 00' N. " 13	19	1	4	" 18, '14	28 54° 5'	"
2° 00' S. " 36	22	1	4	" 25, '14	31 31° 0'	"
2° 00' S. " 36	22	1	4	" 25, '14	31° 3'	"



## SESSIONAL PAPER No. 25b

## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
2°00 S.-NE. cor. sec. 36	22	1	4	Oct. 25, '14	28 8	A. G. Stuart.
11 84 S.-" 36	24	1	4	" 28, '14	35 29 7	"
11 84 S.-" 36	22	1	4	" 28, '14	22 6	"
11 84 S.-" 36	22	1	4	" 28, '14	22 0	"
40°00 S.-" 36	32	1	4	Nov. 8, '14	32 07 5	"
40°00 S.-" 36	32	1	4	" 8, '14	09 9	"
40°00 S.-" 36	32	1	4	" 8, '14	07 9	"
At " 34	80	1	4	May 7, '13	25 24 9	F. V. Seibert.
5°00 S.-" 25	20	2	4	April 30, '14	23 12 1	J. M. Coté.
5°00 W.-" 33	80	2	4	May 12, '13	25 50 0	F. V. Seibert.
At " 31	80	2	4	" 14, '13	13 7	"
At " 19	28	3	4	July 18, '14	23 30 8	G. A. Bennett.
20°00 E.-" 24	42	3	4	Aug. 21, '14	45 9	O. B. Roberts.
14°00 W.-" 36	80	3	4	May 15, '13	25 20 9	F. V. Seibert.
50°00 W.-" 35	80	3	4	" 16, '13	19 4	"
45°00 W.-" 34	80	3	4	" 17, '13	14 6	"
10°00 E.-" 31	80	3	4	" 29, '13	25 13 0	"
40°00 N.-" 2	14	5	4	Oct. 14, '14	22 19 4	M. H. Baker.
2°00 N.-" 26	14	5	4	" 24, '14	05 8	"
40°00 W.-" 35	15	5	4	" 29, '14	25 31 4	"
23°00 E.-" 34	80	5	4	May 29, '13	27 10 7	F. V. Seibert.
5°00 S.-" 24	17	6	4	Nov. 24, '14	24 12 9	M. H. Baker.
40°00 S.-" 23	39	6	4	Aug. 27, '14	28 6	O. B. Roberts.
At " 8	42	6	4	" 20, '14	24 1	"
At " 21	4	7	4	July 11, '14	22 27 5	J. M. Cote.
40°00 S.-" 15	30	7	4	Sept. 4, '14	24 00 1	O. B. Roberts.
39°00 W.-" 31	80	7	4	June 13, '13	30 07 3	F. V. Seibert.
At Station 2, Sec. 7	43	8	4	Oct. 9, '14	25 42 0	G. W. Coltham.
20°00 S.-NE cor. sec. 23	20	9	4	Nov. 18, '14	23 39 2	M. H. Baker.
At " 22	35	9	4	Sept. 11, '14	24 07 6	O. B. Roberts.
40°00 S., " 18	39	9	4	June 29, '14	25 28 8	"
At " 7	40	9	4	" 25, '14	24 5	"
At ¼ cor. E. by sec. 31	41	9	4	" 10, '14	25 5	"
13°00 E.-NE cor. sec. 11	42	9	4	" 7, '14	38 0	"
At Station 4, sec. 7	43	9	4	Sept. 30, '14	25 8	G. W. Coltham.
At NE cor. sec. 16	45	9	4	Aug. 7, '14	25 0	"
At Station 4, sec. 26	46	9	4	" 1, '14	21 9	"
At Station 4, sec. 23	47	9	4	July 31, '14	30 5	"
15°00 S.-NE cor. sec. 5	22	10	4	June 18, '14	23 28 2	J. M. Coté.
15°00 N.-" 10	22	10	4	" 19, '14	32 9	"
At " 13	22	10	4	" 24, '14	35 6	"
At " 12	35	10	4	Sept. 12, '14	24 14 3	O. B. Roberts.
At " 7	39	10	4	July 2, '14	25 28 4	"
At " 17	40	10	4	" 13, '14	22 4	"
At " 6	41	10	4	" 14, '14	17 4	"
20°00 S.-" 36	42	10	4	June 2, '14	25 9	"
At " 7	42	10	4	July 23, '14	29 1	"
At Sta. 3, sec. 32	44	10	4	Aug. 17, '14	25 26 3	G. W. Coltham.
At Sta. 50, sec. 34	45	10	4	July 21, '14	02 1	"
1°00 W.-NE cor. sec. 33	46	10	4	Aug. 3, '14	06 0	"
At Sta. 5, sec. 33	47	10	4	July 7, '14	24 54 5	"
10°00 S.-NE cor. sec. 2	21	11	4	May 17, '14	23 26 1	J. M. Coté.
15°00 S.-" 7	21	11	4	" 20, '14	18 9	"
57°00 S.-" 3	21	11	4	" 9, '14	33 3	"
At " 11	39	11	4	July 4, '14	25 22 6	O. B. Roberts.
At " 21	40	11	4	" 9, '14	20 3	"
At " 23	40	11	4	" 10, '14	05 7	"
At " 27	41	11	4	" 21, '14	19 1	"
At " 33	41	11	4	" 25, '14	27 1	"
2°00 E.-" 11	42	11	4	" 27, '14	32 4	"
20°00 N.-" 12	43	11	4	Sept. 19, '14	32 4	G. W. Coltham.
At Sta. 3, sec. 2	43	11	4	" 25, '14	17 6	"
At Sta. 2, sec. 26	41	11	4	Aug. 17, '14	23 6	"
At Sta. 2, sec. 6	44	11	4	Sept. 17, '14	30 9	"



## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

Place.	Township.	Range.	Meridian.	Date.	Déclination.	Observer.
At Sta. 3, sec. 1	45	11	4	Aug. 16, '14	12° 1'	G. W. Coltham.
50° 00 S. NE cor. sec. 1	45	11	4	Aug. 17, '14	15° 5'	"
30° 00 N.	46	11	4	July 17, '14	18° 7'	"
10° 00 W.	47	11	4	June 15, '14	26 03° 6'	"
At " 33.	47	11	4	" 29, '14	06° 5'	"
30° 00 S.	47	11	4	July 3, '14	25 37° 0'	"
68° 00 W.	80	11	4	" 3, '13	29 46° 5'	F. V. Seibert.
40° 00 W.	9	12	4	Dec. 4, '14	22 06° 4'	M. H. Baker.
2° 00 S.	22	12	4	May 28, '14	23 27° 1'	J. M. Octé.
38° 00 W.	34	12	4	May 30, '14	55° 4'	"
2° 00 N.	8	12	4	June 5, '14	09° 7'	"
At " 16.	39	12	4	July 4, '14	25 20° 8'	O. B. Roberts.
40° 00 S.	40	12	4	" 7, '14	17° 3'	"
At " 20.	41	12	4	" 21, '14	23° 5'	"
40° 00 S.	41	12	4	" 22, '14	22° 7'	"
At " 17.	42	12	4	" 24, '14	25 16° 8'	"
At Sta. 2, sec. 8	44	12	4	Sept. 19, '14	42° 4'	G. W. Coltham.
At Sta. 6, sec. 14	45	12	4	Aug. 26, '14	29° 9'	"
At NE. cor. sec. 17	60	12	4	Oct. 10, '14	26 33° 4'	H. M. R. Soars.
6° 00 W.-NE. cor. sec. 31.	92	12	4	July 31, '14	30 24° 5'	G. H. Blanchet.
At NE. cor. sec. 24.	22	13	4	June 10, '14	23 31° 1'	J. M. Coté.
At " 25.	40	13	4	Aug. 17, '14	25 28° 1'	O. B. Roberts.
At " 12.	41	13	4	" 15, '14	20° 7'	"
At Sta. 4, Lake No. 1	44	13	4	Sept. 16, '14	28° 0'	G. W. Coltham.
At Sta. 2, sec. 24.	45	13	4	Aug. 25, '14	46° 3'	"
5° 00 N.- NE. cor. sec. 24.	46	13	4	" 30, '14	26 08° 7'	"
47° 00 W.	80	13	4	July 19, '13	30 44° 5'	F. V. Seibert.
42° 00 W.	92	13	4	Aug. 6, '14	36° 3'	G. H. Blanchet.
1° 04 W.	96	13	4	May 19, '14	55° 4'	"
11° 20 W.	96	13	4	" 25, '14	31 45° 3'	"
At " 19.	37	14	4	Sept. 21, '14	25 32° 5'	O. B. Roberts.
At " 34.	38	14	4	" 24, '14	30° 4'	"
At " 29.	41	14	4	Aug. 12, '14	20° 5'	"
11° 00 S.	41	14	4	Oct. 6, '14	37° 6'	M. H. Baker.
At " 35.	42	14	4	Aug. 11, '14	27° 0'	O. B. Roberts.
*30° 00 N.	44	14	4	Sept. 5, '14	23° 7'	G. W. Coltham.
40° 00 W.	46	14	4	" 1, '14	42° 7'	"
10° 00 E.-SE. cor. sec. 3	47	14	4	Aug. 31, '14	40° 9'	"
38° 00 W.-NE "	80	14	4	" 1, '13	29 24° 4'	F. V. Seibert.
7° 00 W.	80	14	4	Aug. 5, '13	08° 5'	"
46° 00 W.	92	14	4	" 17, '14	31 05° 9'	G. H. Blanchet.
At " 30.	7	15	4	July 13, '14	23 07° 6'	W. J. Boulton.
40° 00 W.	8	15	4	" 14, '14	23 23° 3'	"
40° 00 W.	9	15	4	" 21, '14	52° 6'	"
40° 00 N.	10	15	4	" 2, '14	22 44° 4'	"
At " 7.	38	15	4	Sept. 29, '14	25 24° 3'	O. B. Roberts.
At NE. cor. sec. 23.	41	15	4	Aug. 5, '14	25 32° 1'	O. B. Roberts.
At " 4.	42	15	4	" 4, '14	23° 6'	"
49° 87 W.	96	15	4	June 4, '14	30 26° 1'	G. H. Blanchet.
63° 75 W.	7	16	4	July 9, '14	23 07° 6'	W. J. Boulton.
63° 75 W.	7	16	4	" 12, '14	22 37° 6'	"
At " 31.	8	16	4	Sept. 21, '14	23 44° 9'	"
At " 23.	9	16	4	" 21, '14	28° 3'	"
40° 00 S.	10	16	4	" 21, '14	20° 3'	"
43° 00 N.	34	16	4	Oct. 28, '14	24 47° 0'	G. A. Bennett.
43° 00 N.	34	16	4	" 28, '14	48° 1'	"
40° 00 W.	34	16	4	" 29, '14	32° 3'	"
At " 12.	38	16	4	" 1, '14	25 27° 3'	O. B. Roberts.
At " 32.	41	16	4	July 29, '14	38° 4'	"
At " 35.	42	16	4	" 31, '14	24° 4'	"
At " 36.	80	16	4	Aug. 19, '13	30 03° 9'	F. V. Seibert.
12° 00 W.	80	16	4	" 27, '13	08° 1'	"
40° 38 W.	92	16	4	" 23, '14	36° 9'	G. H. Blanchet.
3° 00 W.	93	16	4	June 11, '14	31 54° 4'	"



## SESSIONAL PAPER No. 25b

## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
40°00 N.-NE. cor. sec. 26.....	7	17	4	July 14, '14	22 50.9	W. J. Boulton.
At SE. " 3.....	7	17	4	" 22, '14	23 00.4	"
27°47 W. 8. 74 S. NE cor. sec. 9.....	8	17	4	" 16, '14	01.5	"
27°47 W. 8. 74 S. " 9.....	8	17	4	" 17, '14	22 58.1	"
At " 19.....	9	17	4	Aug. 3, '14	23 13.4	"
13°11 W. 27°22 S.-NE. cor. sec. 8.....	10	17	4	" 29, '14	14.5	"
32°37 S. 5°57 W. " 11.....	10	17	4	Sept. 11, '14	27.0	"
At NE. cor. sec. 5.....	11	17	4	" 23, '14	15.7	"
48°00 S. " 3.....	12	17	4	" 23, '14	49.7	"
3°00 N.- " 19.....	34	17	4	Oct. 30, '14	24 21.9	G. A. Bennett.
3°00 N.- " 5.....	37	17	4	Nov. 7, '14	47.5	"
At " 2.....	38	17	4	Oct. 5, '14	25 34.1	O. B. Roberts.
At " 10.....	39	17	4	" 7, '14	25 32.3	"
At " 23.....	42	17	4	Aug. 1, '14	19.3	"
At Sta. 83, Beaver Hills, traverse NE. 28	51	17	4	Oct. 7, '14	26 32.4	H. M. R. Soars.
At Sta. 47, " Lake, sec. 7.....	53	17	4	Sept. 19, '14	24.1	"
Cor. of Lots 1, 2, 13 and 14, Block 2.....	78	17	4	Aug. 28, '14	28 31.1	S. D. Fawcett.
" " 1, 2, 13 and 14, " 2.....	78	17	4	" 29, '14	40.7	"
70°00 W.-NE. cor. sec. 32.....	80	17	4	Sept. 5, '13	30 24.2	F. V. Seibert.
20°00 W.- " 36.....	92	17	4	Aug. 26, '14	31 04.2	G. H. Blanchet.
24°00 W.- " 36.....	96	17	4	June 12, '14	21.1	"
28°00 E.- " 31.....	8	18	4	" 27, '14	23 14.6	W. J. Boulton.
At " 9.....	9	18	4	Aug. 3, '14	09.0	"
35°10 N. 26°62 E.-NE. cor. SE. $\frac{1}{4}$ sec. 22	10	18	4	Sept. 3, '14	19.2	"
63°80 E. 24°60 N.- " " " 22	10	18	44	" 4, '14	14.7	"
63°80 E. 24°60 N.- " " " 22	10	18	4	" 4, '14	13.1	"
63°80 E. 24°60 N.- " " " 22	10	18	4	" 4, '14	08.5	"
63°80 E. 24°60 N.- " " " 22	10	18	4	" 4, '14	07.9	"
63°80 E. 24°60 N.- " " " 22	10	18	4	" 4, '14	06.5	"
63°80 E. 24°60 N.- " " " 22	10	18	4	" 4, '14	05.7	"
63°80 E. 24°60 N.- " " " 22	10	18	4	" 4, '14	06.3	"
63°80 E. 24°60 N.- " " " 22	10	18	4	" 4, '14	06.9	"
40°00 S.-NE. cor. sec. 8.....	11	18	4	Aug. 31, '14	32.4	"
32°00 N.- " 24.....	34	18	4	Oct. 30, '14	24 22.0	G. A. Bennett.
At Sta. 14, Beaver Lake sec. 32.....	51	18	4	Sept. 2, '14	26 22.0	H. M. R. Soars.
At Sta. 8, " 19.....	51	18	4	" 4, '14	19.4	"
At Sta. 20, " 52.....	52	18	4	" 3, '14	18.3	"
19°00 E. $\frac{1}{4}$ on E. by. sec. 23.....	52	18	4	" 16, '14	32.2	"
40°00 W. $\frac{1}{4}$ " 35.....	53	18	4	" 26, '14	30.6	"
33°23 W.-NE. cor. sec. 31.....	96	18	4	June 20, '14	30 21.9	G. H. Blanchet.
78°43 W.-58°00 N.-NE. cor. sec. 12...	9	19	4	July 29, '14	23 10.4	W. J. Boulton.
33°00 W.-NE. cor. sec. 22.....	9	19	4	Aug. 1, '14	08.6	"
At NE. " 20.....	9	19	4	" 1, '14	12.0	"
78°43 W. 58°00 N.-NE. cor. sec. 12...	9	19	4	" 4, '14	11.5	"
78°43 W. 58°00 " 12.....	9	19	4	" 4, '14	12.7	"
78°43 W. 58°00 " 12.....	9	19	4	" 4, '14	11.1	"
78°43 W. 58°00 " 12.....	9	19	4	" 4, '14	11.5	"
78°43 W. 58°00 " 12.....	9	19	4	" 4, '14	10.7	"
78°43 W. 58°00 " 12.....	9	19	4	" 4, '14	13.3	"
78°43 W. 58°00 " 12.....	9	19	4	" 4, '14	14.7	"
78°43 W. 58°00 " 12.....	9	19	4	" 4, '14	14.5	"
78°43 W. 58°00 " 12.....	9	19	4	" 4, '14	15.5	"
78°43 W. 58°00 " 12.....	9	19	4	" 4, '14	16.9	"
78°43 W. 58°00 " 12.....	9	19	4	" 4, '14	13.1	"
78°43 W. 58°00 " 12.....	9	19	4	" 4, '14	12.1	"
78°43 W. 58°00 " 12.....	9	19	4	" 4, '14	10.1	"
40°00 E.-NE. cor. sec. 34.....	35	19	4	Oct. 14, '14	25 19.0	O. B. Roberts.
14°00 S. " 13.....	38	19	4	Nov. 10, '14	22.8	G. A. Bennett.
40°00 S.- " 5.....	39	19	4	Oct. 10, '14	23.5	O. B. Roberts.
At Sta. 15, Dry Grass Lake, sec. 21.....	53	19	4	Sept. 23, '14	27 00.7	H. M. R. Soars.
At Sta. 8, Goose lake, sec. 7.....	53	19	4	" 23, '14	26 35.3	"
12°00 W.-NE. cor. sec. 10.....	54	19	4	Aug. 4, '14	27 10.9	J. M. Côté
20°00 S.- " 2.....	54	19	4	" 12, '14	26 44.0	"
25°00 S.- " 21.....	54	19	4	" 26, '14	27 01.4	"



## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
4°00 E.-NE. cor. sec. 31	54	19	4	Aug. 29, '14	26 52.7	J. M. Coté.
*35°00 E.-" 21	54	19	4	Sept. 5, '14	27 06.4	"
30°00 E.- $\frac{1}{4}$ post E. by sec. 30	57	19	4	Oct. 13, '14	26 38.6	H. M. R. Soars.
74°18 W.-NE. cor. sec. 36	80	19	4	Jan. 19, '14	30 31.1	F. V. Seibert.
67°06 W.-" 31	92	19	4	Sept. 10, '14	27 5	G. H. Blanchet.
40°00 W.-" 24	8	20	4	Aug. 13, '14	23 06.1	W. J. Boulton.
40°00 S.-" 23	9	20	4	" 15, '14	27 3	"
At Sta. 15, traverse Hastings lake, sec. 21	51	20	4	" 11, '14	26 26.4	H. M. R. Soars.
At Sta. 48, traverse Hastings lake, sec. 21	51	20	4	" 19, '14	33.5	"
*At Sta. 11, Wanisan lake, sec. 8	52	20	4	" 24, '14	27.0	"
29°00 E.-NW. cor. sec. 17	70	20	4	Oct. 31, '14	23 52.4	Wm. Christie.
50°00 N.-SE. cor. sec. 5	71	20	4	Sept. 17, '14	29 00.3	"
60°00 E.-NW " 32	71	20	4	" 22, '14	28 53.7	"
1°32 W.-NE " 31	80	20	4	Jan. 24, '14	29 14.6	F. V. Seibert.
7°26 W.-" 36	96	20	4	June 29, '14	30 47.0	G. H. Blanchet.
At $\frac{1}{4}$ post on N. by sec. 9	51	21	4	Aug. 4, '14	26 50.0	H. M. R. Soars.
" 9	51	21	4	" 10, '14	39.4	"
" 9	51	21	4	" 10, '14	35.7	"
" 9	51	21	4	" 12, '14	45.6	"
* " 9	51	21	4	" 18, '14	28.5	"
" 9	51	21	4	" 18, '14	25.1	"
" 9	51	21	4	" 19, '14	52.3	"
At Sta. 13, Cooking lake traverse	52	21	4	July 13, '14	27 01.8	"
" "	52	21	4	" 9, '14	26 36.9	"
" "	52	21	4	" 15, '14	52.0	"
" "	52	21	4	" 21, '14	47.1	"
" "	52	21	4	" 22, '14	52.0	"
" "	52	21	4	" 20, '14	42.4	"
39°00 N.-SE. cor. sec. 25	70	21	4	Aug. 28, '14	28 46.8	Wm. Christie.
22°00 S.-NE " 30	70	21	4	Oct. 13, '14	29 09.7	"
55°00 S.-" 21	70	21	4	" 21, '14	09.3	"
30°00 S.-" 14	70	21	4	" 31, '14	28 38.9	"
30°00 E.-NW " 32	71	21	4	Aug. 10, '14	39.7	"
2°00 N.-NW " 27	71	21	4	" 15, '14	58.0	"
8°60 E.-SW " 4	71	21	4	" 19, '14	29 03.8	"
10°62 W.-" 36	92	21	4	Sept. 16, '14	30 19.5	G. H. Blanchet.
At " 23	51	22	4	July 30, '14	26 26.1	H. M. R. Soars.
30°00 E.-" 20	52	22	4	" 1, '14	29.5	"
65°00 N.-" 22	52	22	4	June 24, '14	49.2	"
At " 4	70	22	4	" 6, '14	28 42.8	Wm. Christie.
20°00 N.-SE. " 28	70	22	4	" 11, '14	44.4	"
30°00 S.-NE. " 32	71	22	4	July 3, '14	30.9	"
At " 22	71	22	4	July 8, '14	29 24.5	"
At " 6	72	22	4	Aug. 13, '14	28 38.5	"
72°44 W.-" 34	80	22	4	Jan. 31, '14	29 09.9	F. V. Seibert.
18°80 W.-" 35	96	22	4	Oct. 17, '14	30 37.6	G. H. Blanchet.
5°00 S.-" 14	40	23	4	Jan. 1, '14	25 38.2	J. B. Saint Cyr.
At SE. " 29	52	23	4	June 9, '14	26 45.1	H. M. R. Soars.
0°39 W.-NE. " 32	80	23	4	Feb. 9, '14	29 14.5	F. V. Seibert.
40°48 W.-" 32	84	23	4	Jan. 14, '14	49.3	G. H. Blanchet.
27°44 W.-" 34	92	23	4	Sept. 29, '14	30 18.5	"
60°35 W.-" 31	96	23	4	Oct. 23, '14	31 08.2	"
58°32 W.-" 35	80	24	4	Feb. 12, '14	28 41.4	F. V. Seibert.
32°43 W.-" 34	84	24	4	Jan. 19, '14	29 29.7	G. H. Blanchet.
51°31 W.-" 34	92	24	4	Oct. 1, '14	30 29.7	"
31°00 S.-" 15	37	25	4	Nov. 21, '14	25 32.2	G. A. Bennett.
39°00 S.-" 15	37	25	4	" 21, '14	38.6	"
5°00 W.-" 36	80	25	4	Feb. 18, '14	30 23.5	F. V. Seibert.
76°40 W.-" 32	80	25	4	" 21, '14	14.5	"
35°85 W.-" 31	84	25	4	Jan. 27, '14	50.4	G. H. Blanchet.
53°00 W.-" 35	80	26	4	Feb. 23, '14	29 58.5	F. V. Seibert.
20°00 N.-" 14	17	27	4	Aug. 19, '14	25 38.4	J. A. Calder.



## SESSIONAL PAPER No. 25b

## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.	
5°00 N.-NE. cor. sec. 13	17	27	4	Aug. 21, '14	26 28.1	J. A. Calder.	
36°00 W.- " 24	17	27	4	" 22, '14	25 14.3	"	
40°25 S.- " 22	17	27	4	" 26, '14	24 48.2	"	
At " 2	64	27	4	Dec. 21, '13	27 52.5	A. L. Cumming.	
At " 2	64	27	4	" 21, '13	52.0	"	
At " 2	64	27	4	" 21, '13	50.6	"	
17°50 W.-SE. " 4	35	28	4	Nov. 16, '14	25 20.6	G. A. Bennett.	
2°00 S.-NE. " 18	2	29	4	Oct. 2, '14	23 52.0	M. P. Bridgland.	
16°42 E.- " 35	34	29	4	Nov. 17, '14	25 29.6	G. A. Bennett.	
At " 32	3	30	4	Aug. 29, '14	24 28.2	M. P. Bridgland.	
½ sec. cor. N. By. sec. 10	3	30	4	Sept. 13, '14	10.6	"	
At NE. cor. sec. 20	3	30	4	" 13, '14	02.3	"	
Traverse St. J. to F.	Wabiskaw Settlement.			4	Aug. 13, '13	29 34.3	G. J. Lonergan.
Cor. marked XLII, XXVIII, XXIX.	Fort Smith, N.W.T.			4	July 31, '14	31 48.2	S. D. Fawcett.
SW. cor. bet. Lots 45 & 46	Smith Land- ing, Alta.			4	Aug. 3, '14	54.1	"
6°41 S. of cor. between lots 51 & 52 on base line.	Resolution, N.W.T.			4	July 22, '14	33 34.4	"
6°41 " " "	" " "			4	" 22, '14	28.6	"
40°00 S.-NE. cor. sec. 21	4	1	5	Nov. 5, '13	24 36.7	W. J. Boulton.	
9°25 S.- " 20	4	1	5	" 7, '13	38.7	"	
At " 23	4	1	5	" 8, '13	41.9	"	
At " 21	4	1	5	Aug. 4, '14	46.8	M. P. Bridgland.	
At ½ sec. cor. E. by sec. 28	4	1	5	" 4, '14	53.6	"	
At NE. cor. sec. 24	4	1	5	" 21, '14	42.4	"	
30°00 S.- " 11	38	1	5	July 24, '14	26 04.5	J. M. Coté.	
17°30 E.- " 32	104	1	5	Aug. 20, '14	32 09.6	J. A. Fletcher.	
1°00 W.- " 36	104	1	5	" 22, '14	31 58.6	"	
At " 32	8	2	5	Sept. 8, '13	24 30.6	W. J. Boulton.	
40°00 W.- " 11	11	2	5	Dec. 8, '13	22.8	"	
At " 8	14	2	5	Jan. 3, '14	22 33.5	"	
At " 5	14	2	5	" 7, '14	23 40.5	"	
At " 19	15	2	5	Aug. 5, '13	40.3	"	
58°81 E.- " 36	100	2	5	Oct. 29, '14	31 14.3	J. A. Fletcher.	
3°00 E.- " 34	104	2	5	Aug. 14, '14	32 02.4	"	
67°44 E.- " 36	104	2	5	" 18, '14	31 43.5	"	
53°40 W.- " 31	112	2	5	May 22, '14	30 56.9	J. R. Akins.	
At ½ sec. cor. middle N. by sec. 9	6	3	5	July 2, '14	24 55.1	M. Bridgland.	
At ½ sec. cor. Middle N. by sec. 9	6	3	5	July 2, '14	24 54.6	M. P. Bridgland.	
0°10 S.-NE. cor. sec. 15	6	3	5	" 2, '14	50.5	"	
7°74 S.-31°59 W.-NE. cor. sec. 20	8	3	5	Oct. 22, '13	05.8	W. J. Boulton.	
40°00 W.-NE. cor. sec. 23	13	3	5	Dec. 18, '13	23 45.4	"	
At " 26	14	3	5	Aug. 27, '13	44.5	"	
22°00 W.- " 33	15	3	5	June 3, '13	24 15.0	"	
At SE. cor. sec. 1	15	3	5	Aug. 14, '13	23 49.8	"	
15°00 E.-NE. cor. sec. 36	100	3	5	Oct. 21, '14	31 08.7	J. A. Fletcher.	
23°28 E.- " 34	104	3	5	Aug. 8, '14	30 33.5	"	
27°00 W.- " 35	112	3	5	May 23, '14	31 01.6	J. R. Akins.	
12°34 W.- " 35	112	3	5	" 25, '14	30 01.5	"	
At " 35	7	4	5	Oct. 7, '13	24 12.4	W. J. Boulton.	
At NE. cor. T. A. McLean's Coal Lease No. 3	19	4	5	Aug. 31, '14	25 02.9	M. H. Baker.	
74°16 E.-NE. cor. sec. 33	100	4	5	Oct. 14, '14	32 15.7	J. A. Fletcher.	
56°72 E.- " 36	104	4	5	Aug. 5, '14	31 35.1	"	
1°00 W.- " 35	112	4	5	May 29, '14	32 13.1	J. R. Akins.	
56°00 W.- " 35	112	4	5	" 30, '14	49.7	"	
62°00 W.- " 35	112	4	5	" 31, '14	57.9	"	
62°00 W.- " 35	112	4	5	" 31, '14	57.6	"	
54°00 W.- " 35	112	4	5	" 31, '14	49.4	"	
54°00 W.- " 35	112	4	5	" 31, '14	50.0	"	
54°00 W.- " 35	112	4	5	" 31, '14	29.4	"	



## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
54°00 W.-NE cor. sec. 35.....	112	4	5	May 31, '14	23°0	J. R. Akins.
54°00 W. " 35.....	112	4	5	" 31, '14	42°0	"
54°00 W. " 35.....	112	4	5	" 31, '14	48°4	"
54°00 W. " 35.....	112	4	5	" 31, '14	37°8	"
54°00 W. " 35.....	112	4	5	" 31, '14	27°8	"
54°00 W. " 35.....	112	4	5	" 31, '14	53°4	"
54°00 W. " 35.....	112	4	5	" 31, '14	02°4	"
6°00 W. " 10.....	8	5	5	Sept. 15, '13	24 20°1	W. J. Boulton.
4°00 E. " 15.....	8	5	5	" 24, '13	06°5	"
11°96 E. " 31.....	100	5	5	Oct. 5, '14	30 43°6	J. A. Fletcher.
15°00 N. " 32.....	76	6	5	Aug. 23, '13	28 53°6	G. J. Lonergan.
35°92 E. " 36.....	100	6	5	Oct. 3, '14	30 16°5	J. A. Fletcher.
9°27 E. " 36.....	104	6	5	July 27, '14	31 11°1	"
2°00 W. " 34.....	112	6	5	June 13, '14	17°4	J. R. Akins.
44°67 W. " 33.....	112	6	5	" 15, '14	32 29°5	"
20°00 S. " 36.....	75	7	5	Sept. 5, '13	29 14°6	G. J. Lonergan.
At " 27.....	75	7	5	" 5, '13	35°0	"
30°18 E. " 31.....	100	7	5	" 21, '14	31 52°3	J. A. Fletcher.
45°00 W. " 36.....	112	7	5	June 13, '14	33 23°6	J. R. Akins.
78°73 W. " 32.....	112	7	5	" 20, '14	34 47°8	"
5°00 W. " 16.....	35	8	5	Sept. 19, '14	26 39°6	T. D. Green.
1°00 S. " 2.....	36	8	5	June 20, '14	26°7	"
3°00 S. " 12.....	36	8	5	July 8, '14	18°8	"
12°00 N. " 21.....	36	8	5	" 16, '14	25°4	"
9°50 E.- $\frac{1}{4}$ cor. N. by sec. 36.....	75	8	5	Sept. 4, '13	29 46°5	G. J. Lonergan.
0°27 W.-NE cor. sec. 34.....	104	8	5	July 8, '14	31 32°2	J. A. Fletcher.
36°90 E. " 36.....	104	8	5	" 10, '14	33°2	"
4°00 N. " 36.....	35	9	5	Sept. 1, '14	26 27°9	T. D. Green.
At " 25.....	73	9	5	Oct. 23, '13	29 41°2	G. J. Lonergan.
49°80 E. " 34.....	100	9	5	Sept. 9, '14	34°5	J. A. Fletcher.
64°68 W. " 34.....	112	9	5	June 29, '14	33 31°0	J. R. Akins.
10°00 S. " 27.....	40	10	5	Oct. 22, '14	27 38°4	T. D. Green.
30°00 S. " 4.....	40	10	5	Nov. 20, '14	29°6	"
20°00 E. " 9.....	78	10	5	Sept. 18, '14	29 36°9	P. R. A. Belanger.
13°55 E. " 33.....	100	10	5	June 13, '14	30 52°7	J. A. Fletcher.
64°40 W. " 34.....	112	10	5	July 3, '14	36 11°3	J. R. Akins.
60°00 W. " 32.....	112	10	5	" 4, '14	35°6	"
12°00 N. " 5.....	26	11	5	" 20, '14	25 57°1	C. M. Walker.
5°00 N. " 19.....	26	11	5	Oct. 10, '14	26 29°2	"
23°00 N. " 36.....	39	11	5	Dec. 2, '14	27 20°5	T. D. Green.
10°00 N. " 25.....	40	11	5	Nov. 7, '14	26°2	"
30°00 S. " 16.....	72	11	5	Sept. 1, '14	29 10°9	P. R. A. Belanger.
17°18 N. " 8.....	73	11	5	Aug. 31, '14	11°5	"
At " 11.....	75	11	5	Dec. 15, '14	28°7	"
12°00 N. " 20.....	80	11	5	May 1, '14	26°4	"
38°00 S. " 28.....	80	11	5	" 4, '14	58°1	"
20°00 S. " 27.....	80	11	5	" 14, '14	30 06°5	"
39°70 E. " 34.....	100	11	5	June 10, '14	30 29°0	J. A. Fletcher.
32°37 W. " 36.....	112	11	5	July 7, '14	36 25°4	J. R. Akins.
17°00 W. " 34.....	112	11	5	" 8, '14	21°6	"
55°52 W. " 32.....	112	11	5	" 10, '14	35 47°5	"
68°75 W. " 31.....	112	11	5	" 11, '14	45°3	"
20°00 N. $\frac{1}{4}$ cor. N. by sec. 23.....	25	12	5	" 24, '14	26 05°1	C. M. Walker.
At NE cor. sec. 12.....	26	12	5	Oct. 19, '14	08°3	"
2°00 S. " 31.....	73	12	5	Sept. 10, '14	30 33°8	P. R. A. Belanger
1°60 N. " 12.....	80	12	5	June 11, '14	29 46°4	"
30°90 E. " 31.....	100	12	5	" 2, '14	31 11°1	J. A. Fletcher.
34°24 W. " 35.....	112	12	5	July 13, '14	35 31°4	J. R. Akins.
At " 21.....	60	13	5	Oct. 26, '13	28 32°9	Jas. Gibbon
26°70 E. " 31.....	100	13	5	May 28, '14	31 14°8	J. A. Fletcher.
32°31 E. " 34.....	100	13	5	" 30, '14	41°0	"
27°03 E. " 36.....	100	13	5	June 1, '14	36°2	"
0°55 W. " 31.....	112	13	5	July 23, '14	35 06°9	J. R. Akins.
41°00 N. " 25.....	77	14	5	Aug. 9, '14	29 54°3	P. R. A. Belanger.



## SESSIONAL PAPER No. 25b

## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
28° 9' W. N. Ecor. sec. 31.	100	14	5	May 21, '14	32 02.5	J. A. Fletcher.
49° 70' W. " 33.	112	14	5	July 26, '14	34 03.9	J. R. Akins.
" " 33.	112	14	5	" 26, '14	33 58.6	"
" " 33.	112	14	5	" 26, '14	34 02.1	"
" " 33.	112	14	5	" 26, '14	33 59.6	"
" " 33.	112	14	5	" 26, '14	57.2	"
" " 33.	112	14	5	" 26, '14	56.8	"
" " 33.	112	14	5	" 26, '14	55.0	"
" " 33.	112	14	5	" 26, '14	49.4	"
" " 33.	112	14	5	" 26, '14	33 46.3	"
" " 33.	112	14	5	" 26, '14	51.6	"
" " 33.	112	14	5	" 26, '14	59.2	"
60° 00' S. " 36.	60	15	5	Sept. 22, '13	29 50.5	G. J. Lonergan.
3° 00' N. " 14.	73	15	5	Aug. 26, '14	00.9	P. R. A. Belanger.
At " 33.	78	15	5	" 17, '14	06.8	"
7° 50' E. " 1.	100	15	5	May 16, '14	32 15.2	J. A. Fletcher.
50° 10' E. " 32.	100	15	5	" 18, '14	28.5	"
32° 00' W. " 33.	112	15	5	Aug. 1, '14	33 09.1	J. R. Akins.
" " 33.	112	15	5	" 1, '14	19.8	"
" " 33.	112	15	5	" 2, '14	22.2	"
31° 00' W. " 33.	112	15	5	" 2, '14	13.7	"
2° 00' E. " 19.	49	16	5	Oct. 26, '14	27 39.5	H. Matheson.
4° 00' E. " 32.	100	16	5	May 11, '14	33 14.8	J. A. Fletcher.
65° 42' W. " 35.	112	16	5	Aug. 4, '14	42.4	J. R. Akins.
53° 92' W. " 34.	112	16	5	" 5, '14	49.6	"
6° 00' N. " 29.	47	17	5	Sept. 2, '13	27 04.7	H. Matheson.
15° 00' E. " 19.	47	17	5	" 9, '13	04.8	"
20° 00' E. " 19.	48	17	5	Aug. 1, '13	28 12.4	"
8° 00' S. " 17.	48	17	5	" 2, '13	27 27.9	"
20° 00' S. " 5.	48	17	5	" 6, '13	14.6	"
41° 00' S. " 5.	48	17	5	" 7, '13	25.3	"
3° 40' E. " 31.	100	17	5	May 4, '14	32 23.9	J. A. Fletcher.
13° 80' W. " 34.	100	17	5	" 6, '14	33 36.2	"
0° 80' W. " 36.	100	17	5	" 8, '14	41.7	"
21° 30' W. " 33.	112	17	5	Aug. 10, '14	37 10.4	J. R. Akins.
" " 33.	112	17	5	" 10, '14	02.9	"
" " 33.	112	17	5	" 10, '14	36 57.2	"
21° 60' W. " 32.	112	17	5	" 11, '14	37 03.4	"
42° 21' S. " 20.	23	18	5	Oct. 6, '14	25 58.2	N. C. Stewart.
At Sta. 629 Traverse, Columbia river, sec. 15.	23	18	5	" 9, '14	57.9	"
At Station 7, Road from Field to Hector	28	18	5	July 16, '14	26 04.2	M. H. Baker.
At NE cor. Field Cemetery.	28	18	5	" 25, '14	16.4	"
At Station 4, Survey of Lot for Geo. Lawes	28	18	5	Aug. 4, '14	05.8	"
At T. H. 74 Road from Field out Yoho Valley	29	18	5	June 29, '14	05.2	"
At T. H. 96, Road from Field out Yoho Valley	29	18	5	July 1, '14	20.7	"
At T. H. 143, Road from Field out Yoho Valley	29	18	5	" 9, '14	04.2	"
2° 80' E.-NE cor. sec. 24.	47	18	5	Aug. 29, '13	28 56.2	H. Matheson.
35° 00' N. " 24.	48	18	5	" 15, '13	27 38.2	"
23° 50' S. " 1.	48	18	5	" 19, '13	07.7	"
20° 00' N. " 10.	77	18	5	Sept. 23, '14	29 11.1	P. R. A. Belanger.
27° 55' W. " 35.	112	18	5	Aug. 14, '14	36 37.1	J. R. Akins.
26° 90' W. " 32.	112	13	5	" 17, '14	07.5	"
46° 11' W. " 31.	112	18	5	" 20, '14	35 55.3	"
60° 00' E. " 31.	23	19	5	" 21, '14	25 52.9	N. C. Stewart.
60° 00' E. " 32.	23	19	5	" 22, '14	52.3	"
8° 00' E. " 34.	23	19	5	Sept. 1, '14	54.7	"
5° 00' E. " 34.	23	19	5	" 1, '14	55.9	"
5° 00' E. " 34.	23	19	5	" 2, '14	55.9	"
28° 00' E. " 33.	23	19	5	" 2, '14	56.0	"



RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—*Continued.*Table I.—Declination Observations.—*Continued.*

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
2°00 E.-NE cor. sec. 33.....	23	19	5	Sept. 2, '14	53°0	N. C. Stewart.
7°00 S.- " 35.....	23	19	5	" 4, '14	55°7	"
60°00 S.- " 35.....	23	19	5	" 4, '14	59°2	"
2°50 E.- " 26.....	23	19	5	" 4, '14	52°7	"
At " 35.....	23	19	5	" 8, '14	49°9	"
55°00 S.- " 36.....	23	19	5	" 10, '14	59°4	"
5°00 E.- " 25.....	23	19	5	" 12, '14	43°1	"
20°00 E.-SE $\frac{1}{2}$ sec. ....30.....	23	19	5	" 14, '14	56°3	"
At NE cor. sec. 36.....	23	19	5	" 23, '14	53°8	"
At T. H. 45 Road from Field, B.C. to Ottetail.....	27	19	5	June 22, '14	26 09°4	M. H. Baker.
50°00 N.-NE cor. sec. 27.....	73	19	5	Nov. 14, '14	29 24°5	P. R. A. Belanger.
At NE cor. sec. 23.....	74	19	5	" 11, '14	27°8	"
2°00 S.-NE cor. sec. 23.....	76	19	5	Oct. 3, '14	20°8	"
79°12 W. " 34.....	112	19	5	Aug. 22, '14	35 13°5	J. R. Akins.
2°25 W. " 31.....	112	19	5	" 25, '14	19°0	"
At " 36.....	23	20	5	" 19, '14	25 53°9	N. C. Stewart.
16°00 W.- " 36.....	23	20	5	" 20, '14	57°1	"
3°00 E.- " 33.....	24	20	5	July 4, '14	54°9	"
22°30 E.- " 31.....	24	20	5	" 7, '14	50°6	"
18°40 E.- " 32.....	24	20	5	" 8, '14	54°0	"
69°00 E.- " 32.....	24	20	5	" 9, '14	53°0	"
At " 28.....	24	20	5	" 13, '14	55°5	"
60°00 W.- " 28.....	24	20	5	" 14, '14	59°4	"
16°00 E.- " 28.....	24	20	5	" 15, '14	51°9	"
70°00 E.- " 28.....	24	20	5	" 16, '14	58°6	"
71°00 S.- " 27.....	24	20	5	" 17, '14	55°5	"
63°00 S.- " 28.....	24	20	5	" 18, '14	52°7	"
14°00 S.- " 7.....	25	20	5	June 30, '14	54°5	"
70°00 E.- " 6.....	25	20	5	July 2, '14	53°0	"
55°00 S.- " 6.....	25	20	5	" 6, '14	56°6	"
At Station 826 Traverse, Columbia R.. sec. 8.....	25	20	5	Oct. 19, '14	59°4	"
47°00 N.-NE cor. sec. 3.....	78	20	5	" 1, '14	29 40°5	P. R. A. Belanger.
17°31 W.- " 31.....	112	20	5	Aug. 31, '14	34 22°2	J. R. Akins.
At " 22.....	25	21	5	June 8, '14	26 10°0	N. C. Stewart.
20°00 N.- " 14.....	25	21	5	" 12, '14	25 56°5	"
5°38 N.- " 13.....	25	21	5	" 15, '14	51°8	"
Course 12-13 Traverse, Columbia R., sec. 33.....	25	21	5	" 22, '14	49°5	"
55°00 N.-NE cor. sec. 30.....	26	21	5	May 11, '14	26 08°0	"
At " 6.....	26	21	5	June 2, '14	25 49°1	"
76°00 W. " 6.....	26	21	5	" 3, '14	55°6	"
At " 19.....	26	21	5	May 14, '14	26 01°2	"
32°00 N.-SE cor. sec 7.....	26	21	5	June 4, '14	25 53°3	N. C. Stewart.
5°00 N.-NE " 21.....	26	21	5	" 5, '14	52°2	"
At T. H. 31 Traverse Columbia R. sec. 8.....	26	21	5	" 8, '14	53°5	"
32°00 N.-NE cor. sec. 16.....	73	21	5	Nov. 19, '14	29 23°7	P. R. A. Belanger.
8°00 S.- " 7.....	79	21	5	Oct. 30, '14	25°6	"
22°00 E.- " 4.....	79	21	5	Nov. 2, '14	37°0	"
35°00 S.-NE. " 19.....	80	21	5	Oct. 28, '14	16°9	"
11°45 W.- " 33.....	112	21	5	Sept. 2, '14	33 57°2	J. R. Akins.
30°00 E.- " 26.....	26	22	5	May 18, '14	26 06°9	N. C. Stewart.
15°00 S.- " 25.....	26	22	5	" 23, '14	00°8	"
60°00 S.- " 23.....	26	22	5	" 25, '14	06°2	"
At T. H. 34, sec. 13.....	27	22	5	Apr. 27, '14	11°5	"
7°00 E.-NE cor. sec. 11.....	27	22	5	" 29, '14	20°1	"
7°23 E.- " 22.....	27	22	5	May 7, '14	14°6	"
45°00 W.- " 31.....	78	22	5	Oct. 19, '14	29 27°9	P. R. A. Belanger.
25°00 N.- " 22.....	80	22	5	" 21, '14	29 19°0	"
34°00 W.- " 33.....	112	22	5	Sept. 9, '14	33 09°5	J. R. Akins.
67°39 W.- " 32.....	112	22	5	" 11, '14	13°9	"
15°00 N.- " 22.....	73	23	5	Nov. 26, '14	29 21°5	P. R. A. Belanger.



## SESSIONAL PAPER No. 25b

## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
20'00 S.-NE. cor. sec. 22.	78	23	5	Oct. 12, '14	40° 5'	P. R. A. Belanger.
43° 00 N.-" 11.	78	24	5	" 16, '14	57° 3'	"
58° 69 W.-" 36.	112	24	5	Sept. 16, '14	34 14 4	J. R. Akins.
20'00 N.-" 1.	73	25	5	Nov. 29, '14	29 22 6	P. R. A. Belanger.
At " 20.	49	26	5	Oct. 27, '14	27 47 1	H. Matheson.
22° 50 S.- $\frac{1}{4}$ post N. by. sec. 20.	49	26	5	" 31, '14	35 5	"
20'00 W.-NE. cor. sec. 35.	71	26	5	Dec. 3, '14	28 38 2	P. R. A. Belanger.
Centre of Lot 27, Lesser Slave Lake Settlement.			5	June 26, '13	29 55 7	G. J. Lonergan.
Centre of Lot 20, on base line Lesser Slave Settlement.			5	" 30, '13	30 11 5	"
Intersection of Base line with N. by. Lot 13, Hay River, N. W. T.			5	" 22, '14	36 47 2	S. D. Fawcett.
At T. H. N. by " Lot 25, " Fort Providence, N. W. T.			5	" 22, '14	32 0	"
At " " " "			5	" 5, '14	37 45 0	"
11° 00 N.-SE. cor. sec. 4.	22	1	6	" 5, '14	29 8	"
At NE. cor. SW. $\frac{1}{4}$ sec. 31.	23	1	6	Oct. 3, '14	25 53 3	W. J. Johnston.
At " NE. cor. sec. 27.	45	1	6	" 17, '14	04 3	"
47° 00 S.-" 15.	45	1	6	May 4, '14	27 25 1	H. Matheson.
30° 00 E.-" 22.	45	1	6	" 8, '14	30 0	"
10° 00 N.-" 14.	45	1	6	" 9, '14	21 2	"
10° 00 N.-" 26.	45	1	6	" 13, '14	36 5	"
10° 00 W.-" 25.	45	1	6	" 18, '14	18 0	"
2° 00 N.-" 8.	45	1	6	" 23, '14	25 1	"
15° 00 W.-" 22.	45	1	6	Nov. 23, '13	25 4	"
40° 00 N.-" 2.	46	1	6	Dec. 11, '13	26 5	"
At " 8.	45	2	6	Oct. 12, '14	19 7	"
60° 00 N.-SE " 8.	20	5	6	Aug. 29, '14	17 1	"
50° 00 W.-SE " 6.	19	6	6	July 4, '14	26 19 2	W. J. Johnston.
10° 00 E.-SW " 5.	19	6	6	June 9, '14	04 2	"
At NE " 25.	19	6	6	" 10, '14	05 4	"
At " 36.	19	6	6	" 18, '14	12 2	"
40° 00 W.-" 36.	20	6	6	" 23, '14	06 8	"
5° 00 W.-SE " 4.	23	6	6	July 1, '14	12 5	"
At " 9.	23	6	6	" 30, '14	15 6	"
40° 25 N.-SE " 17.	23	6	6	Aug. 4, '14	38 2	"
60° 00 N.-" SW. $\frac{1}{4}$ sec. 23.	23	6	6	" 7, '14	22 6	"
At " 22.	23	6	6	" 13, '14	15 0	"
30° 00 W.-NE. cor. NW. $\frac{1}{4}$ sec. 15.	22	7	6	" 14, '14	25 59 7	"
30° 00 S.-NE. cor. sec. 8.	21	12	6	" 26, '14	26 47 2	"
At " 23.	22	12	6	July 21, '14	25 38 4	"
At " 24.	21	13	6	Oct. 30, '14	26 23 2	"
At " 22.	20	14	6	July 18, '14	40 2	"
38° 73 W.-" 14.	23	17	6	Apr. 27, '14	25 53 2	C. H. Taggart.
70° 50 W.-" 13.	23	17	6	May 5, '14	40 5	"
15° 00 W.-" 16.	23	17	6	" 5, '14	26 05 9	"
50° 00 W.-" 16.	23	17	6	" 18, '14	25 46 5	"
55° 11 W.-" 17.	23	17	6	" 19, '14	47 1	"
7° 00 N.-" 18.	23	17	6	" 21, '14	26 13 4	"
32° 84 N.-" 18.	23	17	6	" 22, '14	03 9	"
At " 19.	23	17	6	" 26, '14	25 57 4	"
75° 82 W.-" 19.	23	17	6	" 28, '14	26 05 3	"
40° 00 N.-" 25.	82	17	6	" 29, '14	25 53 3	"
7° 00 N.-" 36.	83	17	6	Nov. 9, '13	31 26 3	L. Brenot.
20° 00 N.-" 12.	83	17	6	Aug. 22, '13	23 1	"
40° 93 W.-" 24.	23	18	6	" 24, '13	28 5	"
25° 00 W.-" 23.	23	18	6	May 30, '14	25 57 9	C. H. Taggart.
65° 60 W.-" 23.	23	18	6	June 1, '14	36 7	"
15° 00 N.-" 21.	23	18	6	" 2, '14	05 4	"
2° 65 W.-" 28.	23	18	6	" 5, '14	23 37 2	"
13° 20 N.- $\frac{1}{4}$ cor. sec. 32.	23	18	6	" 8, '14	27 53 0	"
At NE. cor. sec. 32.	23	18	6	" 13, '14	25 35 2	"
			6	" 15, '14	26 06 1	"



## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
69° 77' W.-NE. cor. sec. 32.	23	18	6	June 16, '14	27 16 6	C. H. Taggart.
69° 77' W. " 32	23	18	6	" 17, '14	19 8	"
33° 25' W. " 31	23	18	6	" 18, '14	24 05 9	"
At " 31	23	18	6	" 19, '14	46 4	"
65° 00' N. " 12	81	18	6	Sept. 28, '13	30 39 8	L. Brenot.
20° 00' S. " 26	82	18	6	" 10, '14	31 29 3	"
10° 00' S. " 26	82	18	6	" 27, '14	05 5	"
30° 00' N. " 12	83	18	6	Aug. 8, '13	12 1	"
60° 00' E.-SE " 2	83	18	6	Sept. 26, '14	21 4	"
21° 00' W.-NE " 1	24	19	6	June 20, '14	26 13 9	C. H. Taggart.
11° 93' N. $\frac{1}{4}$ cor. sec. 1	24	19	6	" 20, '14	26 3	"
23° 00' W.-NE. cor. sec. 17	24	19	6	July 8, '14	27 07 4	"
19° 00' W. $\frac{1}{4}$ cor. N. by sec. 18	24	19	6	" 9, '14	25 43 7	"
15° 00' W.-NE. cor. sec. 17	24	19	6	" 29, '14	26 34 3	"
25° 00' N. " 12	81	19	6	Sept. 10, '13	31 17 6	L. Brenot.
60° 00' N. " 25	81	19	6	" 20, '13	16 6	"
60° 00' S.-NE " 30	22	20	6	Oct. 21, '14	27 02 7	J. A. Calder.
51° 00' E. " 6	23	20	6	" 17, '14	26 44 6	"
1° 00' W. " 5	23	20	6	" 19, '14	27 05 8	"
3° 00' E. $\frac{1}{4}$ post sec. 13	24	20	6	July 10, '14	26 53 3	C. H. Taggart.
At $\frac{1}{4}$ post N. by sec. 15	24	20	6	" 26, '14	47 0	"
At " " 15	24	20	6	" 26, '14	47 2	"
At NE. cor. sec. 14	24	20	6	" 29, '14	16 6	"
38° 00' N. " 21	83	20	6	" 30, '13	30 55 0	L. Brenot.
5° 00' E. " 36	22	21	6	Oct. 16, '14	27 00 6	J. A. Calder.
1° 00' E. " 24	22	21	6	" 22, '14	30 19 4	"
17° 00' S. $\frac{1}{4}$ on N. by sec. 36	22	21	6	" 23, '14	28 47 7	"
1° 00' E.-NE. cor. sec. 24	22	21	6	" 24, '14	30 24 8	"
13° 35' W. " 33	23	21	6	Aug. 13, '14	26 30 3	C. H. Taggart.
10° 26' W. $\frac{1}{4}$ post N. by sec. 32	23	21	6	" 15, '14	27 34 2	"
30° 00' N.-NE. cor. sec. 32	23	21	6	" 17, '14	26 46 7	"
26° 70' S. $\frac{1}{4}$ post E. by sec. 33	23	21	6	" 18, '14	22 7	"
26° 70' " 33	23	21	6	" 19, '14	30 9	"
At NE. cor. sec. 34	23	21	6	" 20, '14	47 5	"
22° 50' N. " 3	24	21	6	" 3, '14	47 4	"
19° 74' W. " 10	24	21	6	" 8, '14	48 5	"
21° 46' W. $\frac{1}{4}$ N. by sec. 18	24	21	6	" 31, '14	05 1	"
43° 00' N.-NE. cor. sec. 3	84	21	6	July 25, '13	31 02 1	L. Brenot.
At $\frac{1}{4}$ post N. by sec. 14	24	22	6	Sept. 2, '14	26 15 1	C. H. Taggart.
6° 00' N.-NE. cor. sec. 22	24	22	6	" 2, '14	25 44 2	"
*4° 00' E. " 21	24	22	6	" 5, '14	51 8	"
37° 80' W. " 21	24	22	6	" 7, '14	23 18 6	"
6° 00' W. $\frac{1}{4}$ N. by sec. 21	24	22	6	" 9, '14	26 30 6	"
40° 10' W. " 20	24	22	6	" 10, '14	34 8	"
19° 00' W. " 19	24	22	6	" 12, '14	24 57 4	"
40° 00' E.-NE. cor. sec. 19	83	22	6	July 20, '13	31 44 5	L. Brenot.
5° 00' S. $\frac{1}{4}$ N. by sec. 7	7	23	6	Oct. 6, '14	24 58 4	Jas. Gibbon.
At " 17	7	23	6	" 10, '14	25 22 0	"
At " 20	7	23	6	" 12, '14	23 8	"
At $\frac{1}{4}$ E. " 29	7	23	6	" 14, '14	14 1	"
At " 28	7	23	6	" 15, '14	18 3	"
74° 00' W.-NE. cor. sec. 22	13	23	6	" 6, '14	48 7	W. H. Norrish.
15° 00' S. " 29	13	23	6	" 7, '14	24 57 6	"
65° 00' W. " 21	13	23	6	" 7, '14	22 06 8	"
25° 00' W. " 22	14	23	6	Aug. 11, '14	28 35 7	"
46° 94' W. " 33	14	23	6	Sept. 1, '14	25 51 6	"
46° 03' W. " 32	14	23	6	" 3, '14	27 5	"
41° 00' N. " 4	14	23	6	Oct. 12, '14	28 48 7	"
9° 00' W. " 3	14	23	6	" 19, '14	23 22 8	"
At " 4	14	23	6	" 20, '14	30 23 7	"
77° 00' S. " 10	15	23	6	Aug. 5, '14	24 44 4	"
9° 76' S. " 8	15	23	6	" 28, '14	25 00 6	"
*45° 00' W. " 5	15	23	6	Sept. 5, '14	24 23 8	"
71° 44' N.-SE. " 6	15	23	6	" 21, '14	26 26 2	"



## SESSIONAL PAPER No. 25b

## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
45° 00 N.-NE. cor. sec. 7.....	15	23	6	Sept. 24, '14	25 20.3	W. H. Norrish.
54° 00 W.-SE. " 6.....	15	22	6	" 29, '14	24 31.6	"
8° 00 W.-NE. " 22.....	24	23	6	" 15, '14	27 40.6	C. H. Taggart.
21° 50 W.- " 21.....	24	23	6	" 17, '14	26 45.2	"
19° 32 W.- $\frac{1}{4}$ post N. by sec. 20.....	24	23	6	" 19, '14	25 55.3	"
* At $\frac{1}{4}$ E. by sec. 21.....	6	24	6	" 5, '14	04.3	Jas. Gibbon.
75° 00 N.- $\frac{1}{4}$ post N. by sec. 22.....	6	24	6	" 12, '14	11.6	"
38° 00 N.-NE. cor. sec. 27.....	6	24	6	" 25, '14	02.1	"
At $\frac{1}{4}$ N. by sec. 35.....	6	24	6	" 29, '14	13.8	"
50° 00 N.-SE. cor. sec. 1.....	15	24	6	" 30, '14	26 17.2	W. H. Norrish.
5° 00 N.- " 4.....	16	24	6	Oct. 28, '14	29.4	"
25° 17 N.-NE. cor. sec. 4.....	16	24	6	" 29, '14	24.1	"
43° 00 S.- " 8.....	18	24	6	Sept. 10, '14	07.3	J. A. Calder.
2° 00 E.- " 9.....	18	24	6	" 12, '14	28 07.3	"
40° 00 S.- " 4.....	18	24	6	" 15, '14	27 47.3	"
20° 00 E.- " 16.....	18	24	6	" 19, '14	25 16.2	"
24° 00 E.- " 15.....	18	24	6	" 22, '14	36.7	"
10° 00 E.-NW. cor. L.S. 12, sec. 24.....	18	24	6	" 28, '14	57.7	"
24° 00 S.-NE. cor. sec. 27.....	18	24	6	" 29, '14	49.6	"
15° 00 N.- " 27.....	19	24	6	Oct. 3, '14	47.7	"
60° 00 W.- " 22.....	19	24	6	" 5, '14	27 23.3	"
10° 00 W.- " 15.....	19	24	6	" 6, '14	28 22.9	"
19° 18 W.-2° 00 S.- $\frac{1}{4}$ N. by sec. 34.....	19	24	6	" 8, '14	27 31.2	"
2° 50 E.-NE. cor. sec. 4.....	20	24	6	" 10, '14	28 24.4	"
45° 00 W.- " 9.....	24	24	6	Sept. 28, '14	15.0	C. H. Taggart.
45° 00 W.- " 9.....	24	24	6	" 29, '14	11.9	"
5° 00 N.- " 36.....	80	24	6	Apr. 4, '14	31 40.7	L. Brenot.
30° 00 N.- " 25.....	80	24	6	" 3, '14	45.7	"
7° 09 N.- " 24.....	81	24	6	" 8, '14	57.3	"
30° 00 N.- " 1.....	82	24	6	" 19, '14	56.7	"
40° 00 N.- " 1.....	84	24	6	July 23, '14	31.6	"
22° 00 E.- " 7.....	5	25	6	May 13, '14	23 47.9	Jas. Gibbon.
20° 00 N.- " 8.....	5	25	6	" 15, '14	24 51.7	"
64° 70 N.- " 8.....	5	25	6	" 16, '14	53.8	"
16° 62 S.- " 8.....	5	25	5	" 17, '14	28.4	"
16° 62 S.- " 8.....	5	25	6	" 19, '14	25 08.0	"
25° 00 N.- " 17.....	5	25	6	" 29, '14	24 51.6	"
7° 00 E.- " 20.....	5	25	6	" 30, '14	25 11.0	"
31° 35 N.- " 21.....	5	25	6	June 3, '14	31.5	"
55° 00 N.- " 20.....	5	25	6	" 10, '14	26.9	"
18° 33 E.- " 17.....	5	25	6	" 22, '14	22.1	"
21° 35 E.- " 20.....	5	25	6	" 22, '14	44.9	"
15° 33 E.- " 17.....	5	25	6	" 23, '14	19.2	"
66° 00 E.- " 17.....	5	25	6	" 23, '14	16.3	"
40° 00 N.- " 16.....	5	25	6	" 25, '14	12.0	"
25° 00 S.- " 16.....	5	25	6	" 27, '14	26.7	"
17° 20 E.- $\frac{1}{4}$ cor. E. by sec. 8.....	5	25	6	July 1, '14	24 18.4	"
8° 00 W.- $\frac{1}{4}$ cor. E. by sec. 17.....	5	25	6	" 2, '14	24 46.3	"
53° 00 W.-NE. cor. sec. 28.....	5	25	6	" 6, '14	25 37.1	"
30° 00 N.- " 28.....	5	25	6	" 13, '14	26 13.8	"
16° 50 N.- " 34.....	5	25	6	" 18, '14	27 06.6	"
61° 34 N.- $\frac{1}{4}$ cor. N. by sec. 35.....	5	25	6	" 28, '14	57.5	"
28° 52 N.-NE. cor. sec. 11.....	5	25	6	Aug. 4, '14	24 48.6	"
27° 36 N.- $\frac{1}{4}$ cor. N. by sec. 13.....	6	25	6	" 15, '14	57.7	"
27° 36 N.- $\frac{1}{4}$ " 13.....	6	25	6	" 13, '14	25 00.1	"
48° 92 N.- $\frac{1}{4}$ " 13.....	6	25	6	" 16, '14	11.3	"
48° 92 N.- $\frac{1}{4}$ " 13.....	6	25	6	" 16, '14	08.3	"
At NE. cor. sec. 24.....	6	25	6	" 17, '14	06.0	"
3° 00 S. centre sec. 3.....	17	25	6	Apr. 28, '14	26 09.7	J. A. Calder.
1° 33 N. 6° 93 W.- $\frac{1}{4}$ cor. E. by sec. 3.....	18	25	6	May 6, '14	19.5	"
16° 00 N.-SE. cor. sec. 4.....	18	25	6	" 8, '14	25 21.0	"
6° 00 N.- " 3.....	18	26	6	" 12, '14	49.3	"
40° 00 W.-NE " 30.....	18	25	6	" 27, '14	26 47.9	"
29° 40 S. 15° 60 E.-centre of sec. 16.....	18	25	6	" 28, '14	34.0	"



## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—Continued.

Table I.—Declination Observations.—Continued.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
28° 55' S. 14° 30' W.-NE. cor. sec. 20.	18	25	6	May 29, '14	25 48° 0	J. A. Calder.
41° 70' E. 48° 62' N.- " 30.	18	25	6	" 30, '14	26 42° 4	"
33° 30' E. 8° 50' S. " 8.	18	25	6	June 3, '14	51° 0	"
At NE. cor. sec. 31.	18	25	6	" 10, '14	59° 6	"
68° 00' S. $\frac{1}{4}$ cor. N. by sec. 16.	18	25	6	" 12, '14	54° 3	"
48° 00' W.-NE. cor. sec. 23.	18	25	6	" 23, '14	33° 2	"
At NW. cor. lot 17, G. 1.	18	25	6	" 27, '14	30° 2	"
25° 00' E.-SW. cor. lot 18, G. 1.	18	25	6	" 26, '14	04° 5	"
15° 50' E.-NW. " 17, G. 1.	18	25	6	" 28, '14	37° 6	"
15° 50' E.- " 17, G. 1.	18	25	6	" 29, '14	36° 8	"
15° 50' E.- " 17, G. 1.	18	25	6	July 4, '14	29° 4	"
At NE. cor. sec. 34.	23	25	6	Oct. 8, '14	04° 9	C. H. Taggart.
12° 00' W. " 34.	23	25	6	" 9, '14	09° 9	"
34° 50' E.-SW. cor. lot 42.	23	25	6	" 17, '14	27 17° 8	"
1° 70' N.-NE. cor. sec. 18.	23	25	6	" 26, '14	04° 5	"
30° 24' S.-NE. cor. sec. 3.	24	25	6	" 7, '14	26 54° 6	"
30° 24' S.- " 3.	24	25	6	" 8, '14	58° 4	"
25° 00' N.- $\frac{1}{4}$ cor. E. by sec. 21.	5	26	6	" 22, '14	25 29° 3	Jas. Gibbon.
20° 00' W.-NE. cor. sec. 21.	5	26	6	" 23, '14	25° 0	"
54° 00' S.- " 14.	11	26	6	Apr. 29, '14	57° 2	W. H. Norrish.
24° 00' S.- " 11.	11	26	6	" 30, '14	26 00° 4	"
51° 00' S.- " 11.	11	26	6	May 1, '14	25 52° 2	"
4° 50' S.- " 2.	11	26	6	" 2, '14	48° 4	"
30° 00' S.- " 2.	11	26	6	" 4, '14	48° 7	"
23° 00' N.- " 14.	11	26	6	" 12, '14	53° 9	"
55° 00' N.- " 14.	11	26	6	" 13, '14	26 02° 4	"
11° 00' W.- " 23.	11	26	6	" 14, '14	25 58° 1	"
46° 00' W.- " 23.	11	26	6	" 15, '14	55° 3	"
46° 00' W.- " 23.	11	26	6	" 16, '14	54° 6	"
61° 00' E.- " 23.	11	26	6	" 16, '14	26 00° 8	"
34° 00' E.- " 33.	11	26	6	" 20, '14	25 48° 8	"
43° 60' S.- " 34.	11	26	6	" 22, '14	47° 4	"
70° 00' S.- " 34.	11	26	6	" 23, '14	53° 6	"
21° 20' S.- " 27.	11	26	6	" 26, '14	26 09° 2	"
50° 00' N.-SE. " 3.	12	26	6	" 29, '14	03° 7	"
50° 00' N.-NE. " 3.	12	26	6	" 30, '14	02° 6	"
30° 00' W.- " 10.	12	26	6	June 3, '14	07° 9	"
56° 00' W.- " 10.	12	26	6	" 4, '14	25 55° 6	"
3° 00' S.- " 9.	12	26	6	" 9, '14	26 01° 0	"
30° 00' S.- " 9.	12	26	6	" 10, '14	00° 3	"
22° 50' N.-SE. " 4.	12	26	6	" 11, '14	25 42° 3	"
32° 50' N.-NE. " 9.	12	26	6	" 22, '14	59° 1	"
60° 00' W.- " 16.	12	26	6	" 25, '14	59° 6	"
22° 00' N.- " 5.	12	26	6	July 6, '14	26 12° 7	"
33° 40' S.-NW. " 19.	12	26	6	" 10, '14	25 53° 3	"
95° 00' N.-SE. cor. Lytton, I.R. No. 15.	16	26	6	" 10, '14	28 14° 4	J. A. Calder.
45° 10' N.-NE. cor. sec. 19.	16	26	6	" 14, '14	26 13° 1	"
65° 00' N.-NE. cor. sec. 19.	16	26	6	" 16, '14	26 58° 5	"
23° 00' S.- $\frac{1}{4}$ cor. N. by sec. 34.	16	26	6	" 25, '14	27 01° 7	"
180° 70' N.-SW. cor. Lytton, I.R. No. 15.	17	26	6	Aug. 1, '14	25 57° 9	"
55° 00' S.-NE. cor. sec. 18.	3	30	6	" 18, '14	24 34° 3	P. Melhuish.
At NE.-SW. $\frac{1}{4}$ sec. 12.	4	29	6	July 24, '14	25° 3	"
At NE.-NW. $\frac{1}{4}$ sec. 12.	4	29	6	" 25, '14	44° 3	"
64° 38' E.-NE. cor. sec. 15.	4	29	6	" 31, '14	26 09° 4	"
56° 11' N.-NW. " 17.	3	30	6	June 14, '14	23 41° 2	"
12° 60' S. 15° 00' W.-NW. cor. sec. 20.	3	30	6	" 17, '14	43° 6	"
13° 52' W. 18° 88' N.-NE. " 20.	3	30	6	" 30, '14	22° 1	"
15° 72' S.-NE. cor. sec. 24.	3	30	6	Aug. 21, '14	24 25° 3	"
32° 52' N.- " 14.	3	30	6	" 27, '14	23 14° 2	"
25° 00' S.- " 15.	3	30	6	Oct. 27, '14	21 44° 7	"
63° 77' N.- " 15.	3	30	6	Sept. 4, '14	22 42° 4	"
29° 54' N.- " 11.	3	30	6	" 15, '14	23 44° 1	"
At SE. cor. lot 8.	Wigley.					
	N.W.T.			Aug. 11, '13	40 24° 1	S. D. Fawcett.



## SESSIONAL PAPER No. 25b

RESULTS OF MAGNETIC OBSERVATIONS, 1914-15.—*Continued.*

Table I.—Declination Observations—Concluded.

Place.	Township.	Range.	Meridian.	Date.	Declination.	Observer.
2°00 S.-cor. bet. lots 4 & 5 on base line.	Wrigley,					
At I.P. Pits at E. end of N. by lot 5...	N.W.T.			July 15, '14	39 37.2	S. D. Fawcett.
	Simpson,					
	N.W.T.			July 27, '13	37 32.8	"
At NE. cor. lot 38 .....	"			June 24, '14	32.6	"
At " 38 .....	"			" 28, '14	34.6	"
At " 38 .....	"			" 28, '14	32.2	"
7°60 N. 6°00 W. $\frac{1}{4}$ cor. N. by sec. 18...	5	4	7	June 8, '14	25 43.2	P. Melhuish.
At west I.P. Pits N. by lot 7 .....	Good Hope,					
	N.W.T.			Sept. 16, '13	42 04.1	S. D. Fawcett.
At " " 8 .....	"			" 16, '13	40 57.2	"
At " " " .....	"			" 17, '13	41 01.4	"
At " " 7 .....	"			" 17, '13	40 8	"
At " " " .....	"			" 17, '13	36.9	"
At SW. cor. lot 7 .....	Norman,					
	N.W.T.			Nov. 15, '13	40 21.5	"
At cor. bet. Lots 9 & 10 on base line...	"			July 9, '14	40 54.7	"
At " " " " .....	"			" 12, '14	41.7	"
75°00 S. $\frac{1}{4}$ cor. N. by sec. 35 .....	39		C	Oct. 9, '14	24 01.2	P. Melhuish.
75°00 " " 26 .....	39		C	" 14, '14	23 29.4	"
39°00 " " 35 .....	39		C	" 15, '14	24 11.6	"
37°65 E.-NE. cor. sec. 34 .....	39		C	Sept. 25, '14	26 03.0	"
38°50 S. 11°10 E.-NE. cor. sec. 23 .....	Frac. tp. 39		C	May 27, '14	43.7	"
9°20 S. 21°00 W.- " 24 .....	" 39		C	" 28, '14	24 24.6	"
21°00 S. 18°50 W.- " 24 .....	" 39		C	" 29, '14	26 12.9	"
34°00 S.- " " 23 .....	" 39		C	" 30, '14	28 00.4	"



## RESULTS OF MAGNETIC OBSERVATIONS, 1914-15—Concluded.

TABLE II.—Inclination and Total Intensity.

Station, Distance in chains from nearest post.	Township.	Range.	Meridian.	Date.	Inclination.		Total Intensity.		Observer.	Instrument.
					L. M. T.	Value.	L. M. T.	Value.		
10°00' E. 20°00' S.-NE. cor. sec. 33	14	2	Pr.	July 22, '14	8°7'-9°8'	78 10°7'	9°1'-9°5'	0.62920	E. J. Wight...	T. S. 62.
10°00' E. 20°00' S. " 33	14	2	"	" 22, '14	9°5'-10°5'	78 10°8'	9°8'-10°2'	0.62919	"	"
10°00' E. 20°00' S. " 33	14	2	"	" 22, '14	10°2'-11°2'	78 10°9'	10°5'-10°9'	0.62910	"	"
5°00' E. 30°00' S. " 33	14	2	Nov.	Nov. 6, '14	9°3'-10°5'	78 10°6'	9°8'-10°2'	0.62996	"	"
5°00' E. 30°00' S. " 33	14	2	"	" 6, '14	10°1'-11°3'	78 10°3'	10°5'-10°9'	0.62993	"	"
5°00' E. 30°00' S. " 33	14	2	"	" 6, '14	10°9'-12°1'	78 10°2'	11°3'-11°8'	0.62994	"	"
1°00' W.-NE. cor. sec. 28	14	2	July	July 18, '14	13°6'-15°3'	78 08°9'	14°2'-14°7'	0.62899	R. C. Purser....	"
1°00' W. " 28	14	2	"	" 18, '14	14°6'-16°2'	78 08°8'	15°3'-15°7'	0.62947	"	"
1°00' W. " 28	14	2	"	" 18, '14	15°7'-17°1'	78 08°8'	16°2'-16°6'	0.62939	"	"
1°00' W. " 28	14	2	Nov.	Nov. 10, '14	10°0'-11°5'	78 10°3'	10°6'-11°1'	0.62913	"	"
1°00' W. " 28	14	2	"	" 10, '14	11°1'-12°5'	78 10°0'	11°6'-12°0'	0.62876	"	"
1°00' W. " 28	14	2	"	" 10, '14	12°1'-13°3'	78 09°1'	12°5'-13°0'	0.62952	"	"
15°00' E. 27°00' N.-NE. cor. sec. 28	14	27	July	July 26, '14	9°0'-10°1'	77 12°9'	9°4'-9°8'	0.62573	E. J. Wight....	"
15°00' E. 27°00' N. " 28	9	27	"	" 26, '14	9°8'-10°9'	77 12°7'	10°1'-10°4'	0.62574	"	"
15°00' E. 27°00' N. " 28	9	27	"	" 26, '14	10°4'-11°5'	77 12°8'	10°8'-11°2'	0.62579	"	"
20°00' W. 30°00' N. " 22	21	31	June	June 24, '14	9°2'-10°1'	78 02°0'	9°5'-9°9'	0.63267	"	"
20°00' W. 30°00' N. " 22	21	31	"	" 24, '14	9°9'-10°7'	78 02°1'	10°1'-10°5'	0.63267	"	"
20°00' W. 30°00' N. " 22	21	31	"	" 24, '14	10°5'-11°4'	78 02°1'	10°7'-11°1'	0.63270	"	"
25°00' E. 8°00' S.-NE. cor. sec. 3	28	17	June	June 27, '14	14°2'-15°3'	77 47°1'	14°6'-14°9'	0.62962	"	"
26°00' E. 8°00' S. " 3	28	17	"	" 27, '14	14°9'-16°6'	77 47°3'	15°3'-15°6'	0.62966	"	"
26°00' E. 8°00' S. " 3	28	17	"	" 27, '14	15°6'-16°6'	77 47°5'	15°9'-16°3'	0.62969	"	"
9°00' S. 12°00' E. " 25	25	17	July	July 1, '14	7°2'-8°3'	77 40°2'	7°6'-7°9'	0.62770	"	"
9°00' S. 12°00' E. " 25	25	17	"	" 1, '14	7°9'-8°9'	77 40°1'	8°3'-8°6'	0.62771	"	"
9°00' S. 12°00' E. " 25	25	17	"	" 1, '14	8°6'-9°6'	77 40°2'	8°9'-9°3'	0.62779	"	"
35°00' S. 4°00' W. " 7	23	19	Oct.	Oct. 29, '14	10°3'-11°4'	77 28°1'	10°7'-11°0'	0.62616	"	"
35°00' S. 4°00' W. " 7	23	19	"	" 29, '14	11°0'-12°1'	77 28°1'	11°4'-11°8'	0.62617	"	"
35°00' S. 4°00' W. " 7	23	19	"	" 29, '14	11°8'-12°9'	77 28°0'	12°1'-12°5'	0.62607	"	"
29°00' N. 25°00' W. " 34	29	13	Sept.	Sept. 10, '14	13°0'-14°6'	77 01°7'	13°6'-14°0'	0.62550	"	"
29°00' N. 25°00' W. " 34	29	13	"	" 10, '14	14°4'-15°2'	77 01°7'	14°6'-14°9'	0.62500	"	"
20°00' N. 25°00' W. " 34	29	13	"	" 10, '14	14°9'-16°0'	77 01°5'	15°2'-15°6'	0.62604	"	"
2°00' S. 0°20' E. " 13	39	13	Sept.	Sept. 25, '14	9°2'-10°3'	77 42°0'	9°6'-10°0'	0.62703	"	"
2°00' S. 0°20' E. " 13	39	13	"	" 25, '14	10°0'-11°7'	77 42°1'	10°3'-10°6'	0.62700	"	"
2°00' S. 0°20' E. " 13	39	13	"	" 25, '14	10°6'-11°0'	77 42°0'	11°0'-11°3'	0.62709	"	"
9°00' N. 1°50' E. " 26	19	15	Oct.	Oct. 13, '14	13°5'-14°6'	76 35°1'	13°9'-14°2'	0.61840	"	"
9°00' N. 1°50' E. " 26	19	15	"	" 13, '14	14°2'-15°3'	76 35°1'	14°6'-15°0'	0.61833	"	"
9°00' N. 1°50' E. " 26	19	15	"	" 13, '14	15°0'-16°1'	76 35°1'	15°3'-15°7'	0.61820	"	"



## SESSIONAL PAPER No. 25b

20 00 S.	5 00 E.	"	19.....	24	15	3	Sept.	2, '14	9 2-10 4	76 35 2	9 6-10 0	0 62247
20 00 S.	5 00 E.	"	19.....	24	15	3	"	2, '14	10 1-11 1	76 35 2	10 4-10 7	0 62251
20 00 S.	5 00 E.	"	19.....	24	15	3	"	2, '14	10 7-11 7	76 35 3	11 1-11 4	0 62246
7 00 N.	5 00 E.	"	28.....	36	20	3	Aug.	10, '14	8 1-9 2	77 22 2	8 5-8 8	0 62253
7 00 N.	5 00 E.	"	28.....	36	20	3	"	10, '14	8 8-9 8	77 22 8	9 2-9 5	0 62274
7 00 N.	5 00 E.	"	28.....	36	20	3	"	10, '14	9 5-10 5	77 23 6	9 8-10 2	0 62264
4 00 E.	29 00 N.	"	33.....	47	20	3	Oct.	1, '14	13 5-14 7	78 03 6	13 9-14 3	0 62481
4 00 E.	29 00 N.	"	33.....	47	20	3	"	1, '14	14 3-15 3	78 03 2	14 6-15 0	0 62476
4 00 E.	29 00 N.	"	33.....	47	20	3	"	1, '14	15 0-16 1	78 03 4	15 3-15 7	0 62464



## APPENDIX No. 63.

## RESULTS OF WATCH TRIALS.

Name.	Number of Watch.	Escapement, Balance Spring, etc.	Mean Daily Variation of Mean Daily Rate.										Mean Error.	Diff. between m.d.r. and m. of m.d.r. at 65° F.						Mean Error. $\beta$	M. ch. of r. for 1° F.	Total Marks.
			Mean Daily Variation of Mean Daily Rate.											Diff. between m.d.r. and m. of m.d.r. at 65° F.								
			P. U. 65°	P. R. 65°	P. L. 65°	D. U. 65°	D. U. 40°	D. U. 65°	D. U. 90°	D. D. 65°	P. U. 65°	P. U. 65°		P. R.	P. L.	D. U.	D. D.	P. U.				
Waltham Watch Co.	18991085	D.r., g. b., l. e., s. o.	0.36	0.59	0.17	0.51	0.46	0.72	0.19	0.56	0.44	0.56	0.44	+2.25	-2.21	-1.49	+0.43	+1.11	-0.07	1.26	0.02	610.1
"	17162246	"	0.33	0.70	0.32	0.60	0.46	0.49	0.21	0.18	0.41	0.18	0.41	+0.81	-0.83	-4.05	+1.63	+1.81	+0.63	1.63	0.06	539.6
"	17162252	"	0.34	0.61	0.35	0.35	0.36	0.50	0.74	0.32	0.45	0.32	0.45	+1.52	0.00	-4.04	+2.54	+0.56	-0.56	1.54	0.06	528.0
"	18121201	"	0.47	0.50	0.51	0.53	0.10	0.26	0.52	0.69	0.45	0.69	0.45	-0.33	-2.45	+3.11	+1.75	-1.27	-0.81	1.62	0.08	520.2
"	18097048	"	0.62	0.51	0.34	0.08	0.30	0.54	0.37	0.68	0.43	0.68	0.43	+1.84	-4.22	-0.46	-0.06	+2.38	+0.52	1.58	0.11	517.8
Hamilton Watch Co.	688379	"	0.22	0.59	0.55	0.59	0.50	0.64	0.36	0.35	0.48	0.35	0.48	-0.83	3.61	+2.27	+2.01	+0.73	-0.59	1.67	0.08	482.1
"	80	"	0.31	0.70	0.42	0.99	0.47	0.64	1.00	0.16	0.59	0.16	0.59	+2.71	-2.65	-0.41	+0.41	-0.83	+0.77	1.30	0.08	468.2
Waltham Watch Co.	18091100	"	1.26	0.22	0.42	0.26	0.11	0.58	0.22	1.59	0.58	0.22	1.59	+0.30	-5.50	+1.40	+0.18	+1.74	+1.90	1.84	0.06	438.8
"	1096	"	0.80	0.78	0.47	0.52	0.67	0.71	0.67	0.57	0.65	0.57	0.65	+0.55	-0.97	-2.71	+1.71	+0.11	+1.31	1.23	0.13	416.6
"	98	"	0.64	0.49	1.22	0.91	0.56	0.50	0.34	0.40	0.63	0.40	0.63	+0.41	-3.73	+1.79	+1.51	-1.41	+1.41	1.71	0.08	401.8
"	35	"	0.63	0.66	0.62	0.80	1.04	0.81	0.27	0.40	0.65	0.40	0.65	+3.78	-2.58	+2.32	-0.66	-3.10	+0.24	2.11	0.06	356.8
"	18121061	"	0.85	0.33	0.30	1.36	0.55	0.35	0.38	0.59	0.59	0.38	0.59	-0.85	-1.53	+5.29	-1.15	+1.69	-3.45	2.33	0.10	351.7
"	18091078	"	0.54	0.38	0.63	0.75	0.77	0.53	0.26	0.46	0.54	0.26	0.46	-2.65	+5.45	-6.51	+0.59	+2.75	+0.35	3.05	0.02	349.7
"	18028514	"	0.64	0.72	0.37	0.84	1.19	0.27	0.23	0.65	0.61	0.23	0.65	-1.83	-2.23	+2.21	+4.20	+0.88	-3.18	2.41	0.10	317.4
"	18091014	"	0.11	0.12	1.36	0.67	0.38	0.21	0.34	0.60	0.47	0.60	0.47	+2.23	-2.33	-7.23	+2.69	+2.09	+2.57	3.19	0.11	314.1
Means.....			0.54	0.53	0.54	0.65	0.53	0.52	0.41	0.54	0.53	0.54	0.53	1.53	2.69	3.02	1.43	1.49	.....	1.90	0.08	.....



SESSIONAL PAPER No. 25b

## APPENDIX No. 64.

## Surveying Instruments on Hand, March 31, 1915.

Instruments.	In Stock April 1, 1914.	Purchased 1914-1915.	Sold 1914-1915.	Balance on hand, March 31, 1915.		Remarks.
				On loan.	In store.	
Abney levels. ....	52		10	4	38	
Alidades. ....		1			1	
Alt-azimuths. ....	1				1	
Aneroids. ....	102		8	4	90	
Artificial Horizons. ....	4				4	
Base line apparatus. ....	1				1	
Cameras and Kodaks. ....	17	2		4	14	One destroyed in bush fire.
Compasses. ....	34				34	
Current meters and logs. ....	4				4	
Dip circles. ....	2				2	
Field glasses and binoculars. ....	7			3	4	
Levels. ....	38			10	28	
Levelling rods. ....	85	3		25	40	23 worn out on surveys.
Micrometer telescopes. ....	8				8	
Optical squares. ....	1			1		
Pedometers. ....	2				2	
Photo-theodolites. ....	5			1	4	
Plane tables. ....		1			1	
Protractors. ....	40			1	39	
Rod levels. ....	19	6		8	14	Three lost on survey.
Sextants and reflecting circles. ....	3				3	
Sidereal watches. ....	66	1	5	3	59	
Solar compasses. ....	2				2	
Stadia rods. ....	20	20	18	1	18	Three worn out on survey.
Stadia slide rules. ....	22		1	1	20	
Steel tapes. ....	150	27	38	9	130	
Subsidiary standard measures. ....	111	5	14		102	
Survey pickets. ....	2				2	
Surveying cameras. ....	4				4	
Tally registers. ....	12				12	
Tape stretching apparatus. ....		1		1		
Telemeters. ....	1			1		
Thermometers. ....	17		1	2	14	
Transit theodolites. ....	51	35	22	4	60	
Zenith telescopes. ....	1			1		

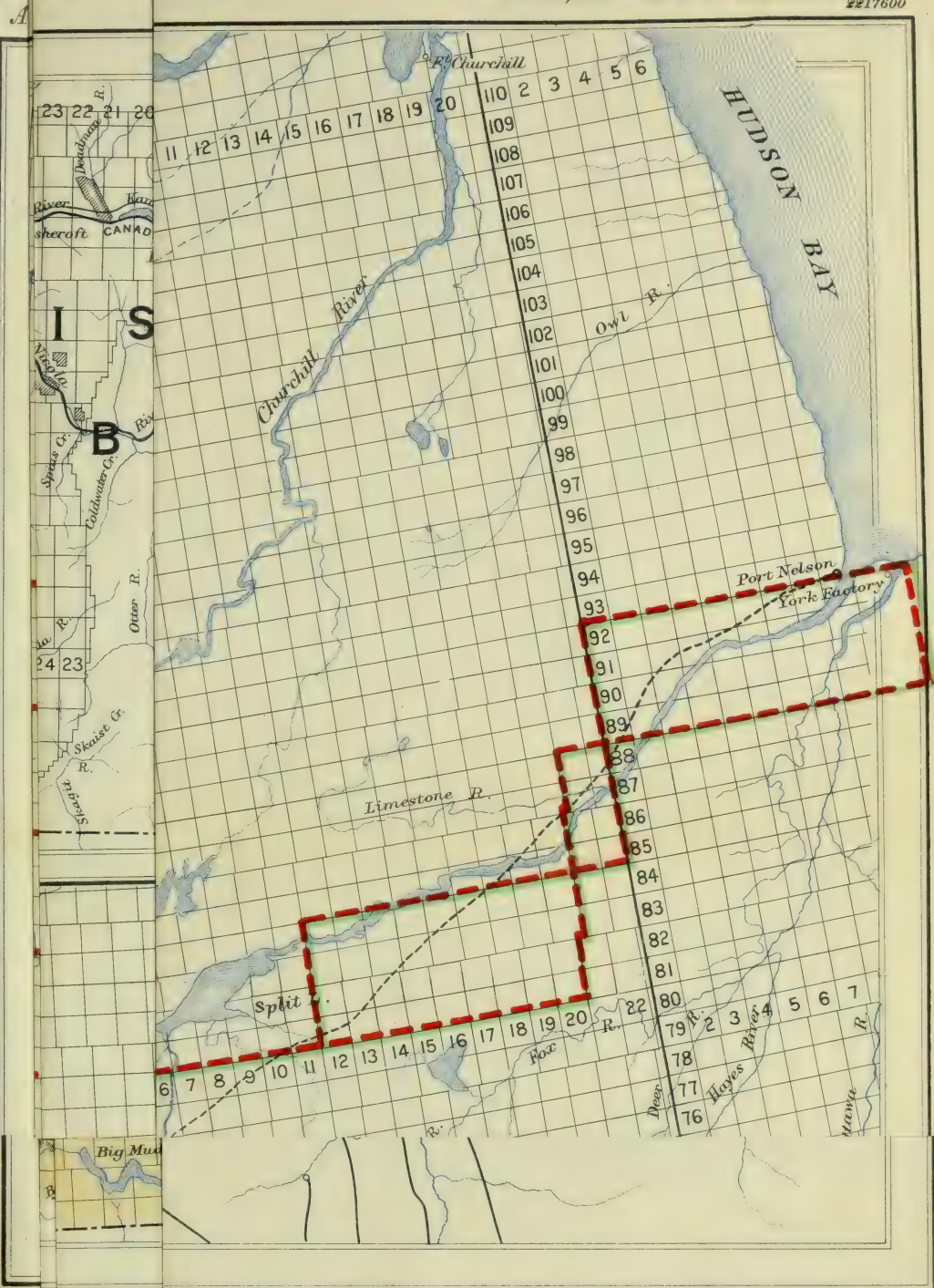






# BE

Scale, 35 miles to an inch  $\frac{1}{2217600}$



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 h Columbia are not shown owing to their scattered nature.  
 h 31, 1915  
 March 31, 1915

ZINCOGRAPHED AT THE SURVEYOR GENERAL'S OFFICE OTTAWA, CANADA

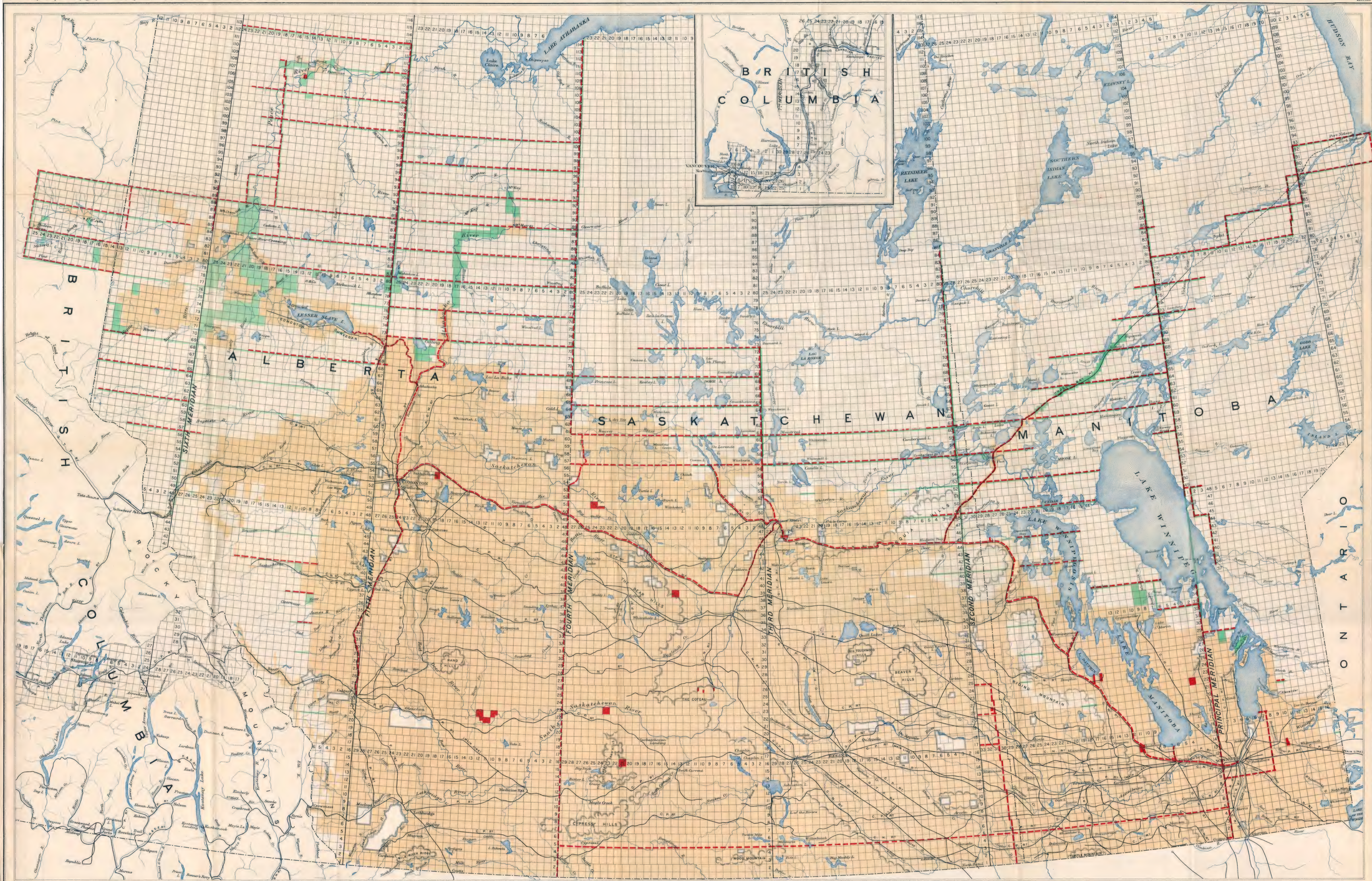


# INDEX TO TOWNSHIPS IN MANITOBA, SASKATCHEWAN, ALBERTA AND BRITISH COLUMBIA

Annual report of the Topographical Surveys Branch, Department of the Interior, 1914-1915

To Illustrate Progress of Dominion Lands Surveys

Scale, 35 miles to an inch



Subdivision surveys made prior to March 31, 1914.  
 Subdivision surveys made from April 1, 1914 to March 31, 1915.  
 Resurveys made from April 1, 1914 to March 31, 1915.

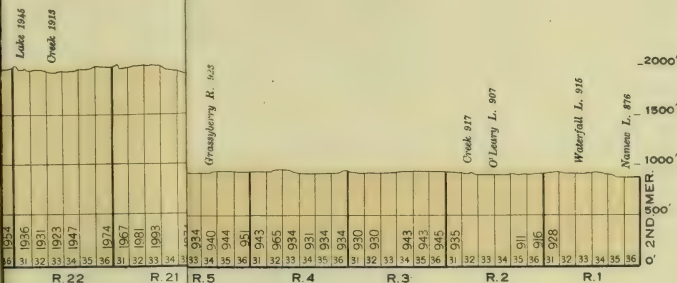
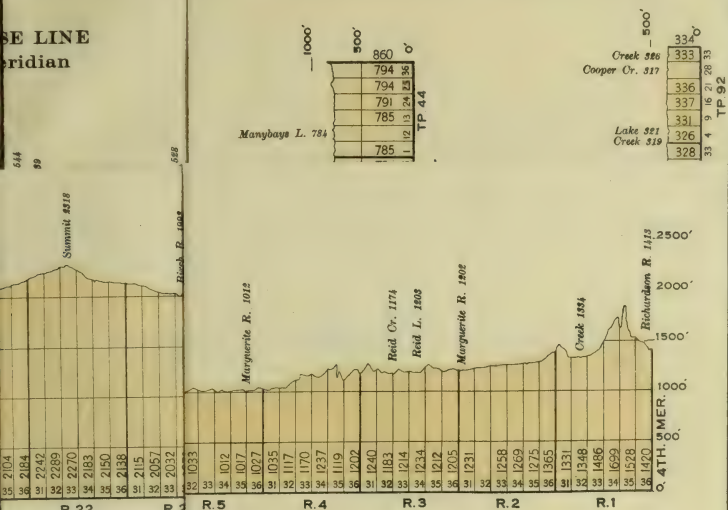
CAUTION:— This is only an index, topographical and other features are not to be depended upon.

Surveys in the Railway Belt in British Columbia are not shown owing to their scattered nature.  
 Lines of spirit levels run prior to March 31, 1915.  
 Base and meridian lines run prior to March 31, 1915.

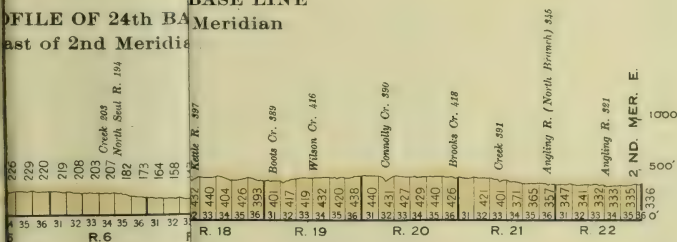


ad ME

SE LINE  
Meridian



BASE LINE  
PROFILE OF 24th Base Line Meridian  
East of 2nd Meridian

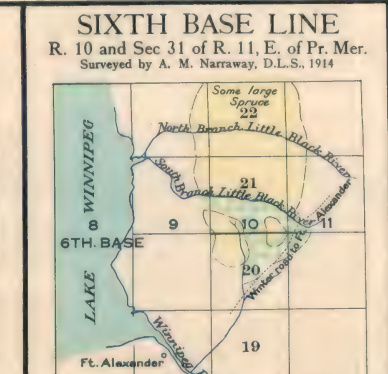
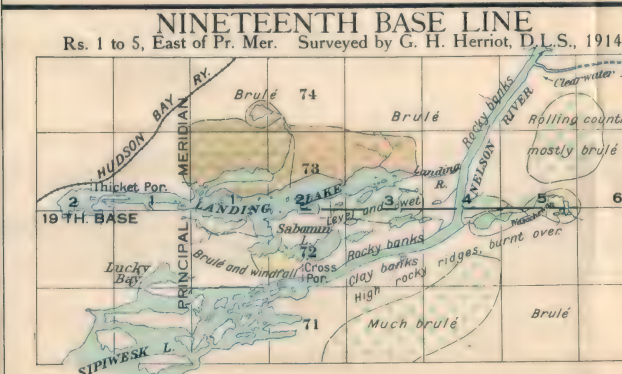
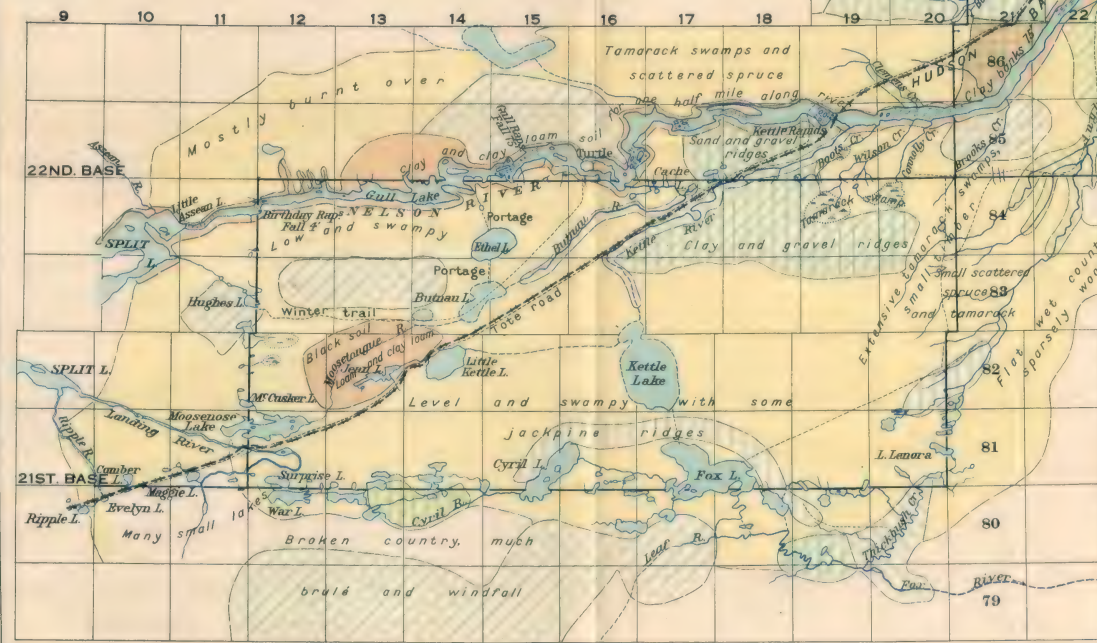


VERTICAL SCALE OF PROFILES. 2,000 FEET TO AN INCH.

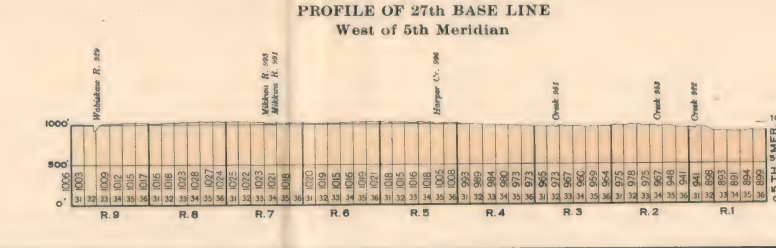
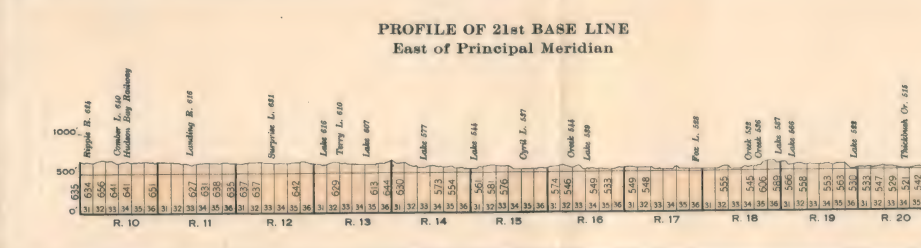


# SKETCH MAPS and PROFILES of BASE LINES and MERIDIANS

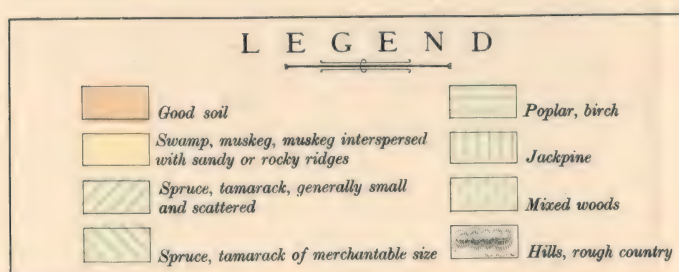
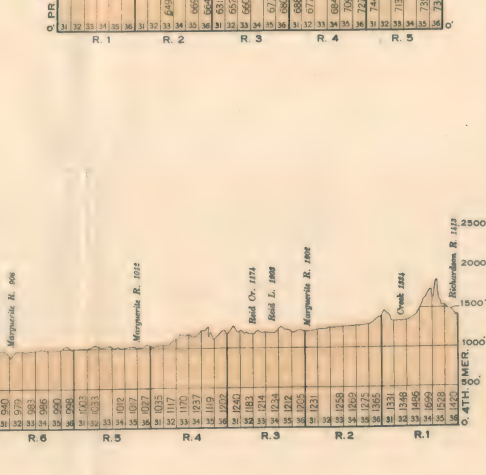
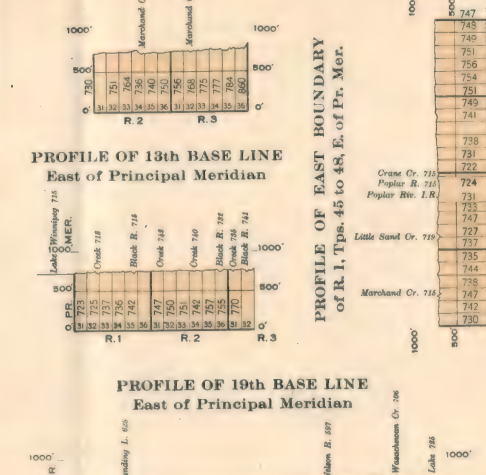
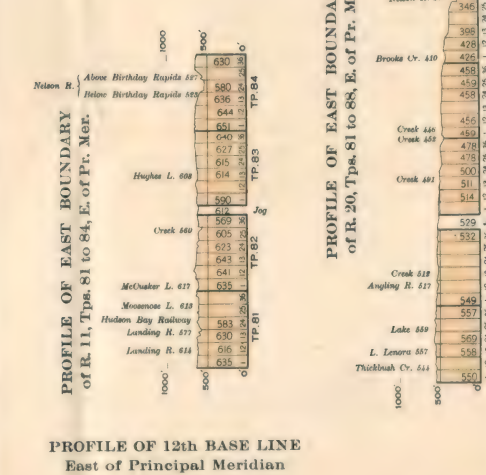
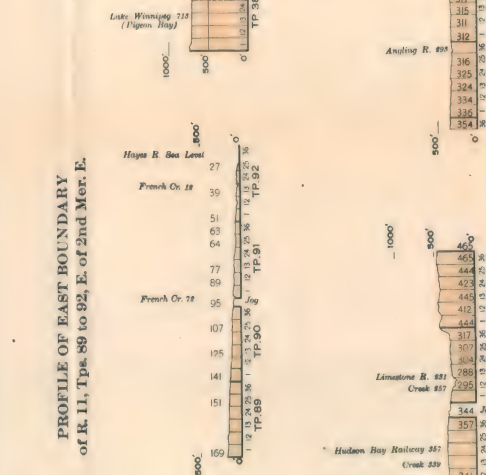
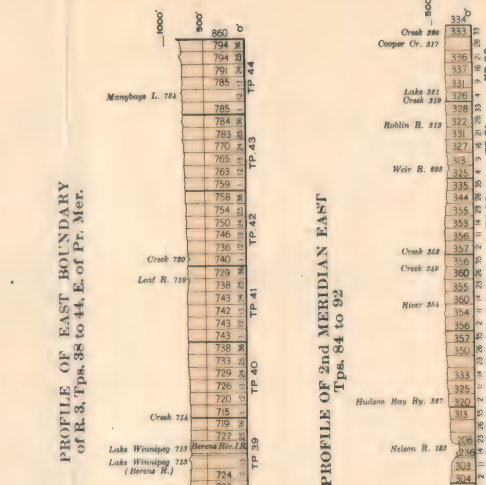
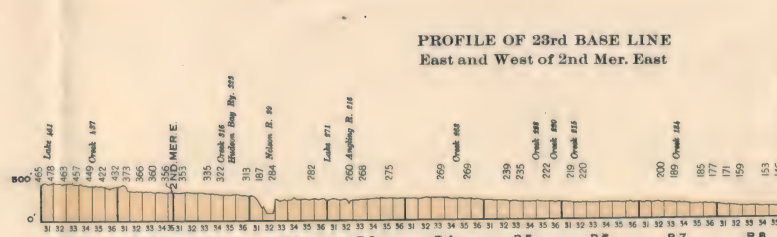
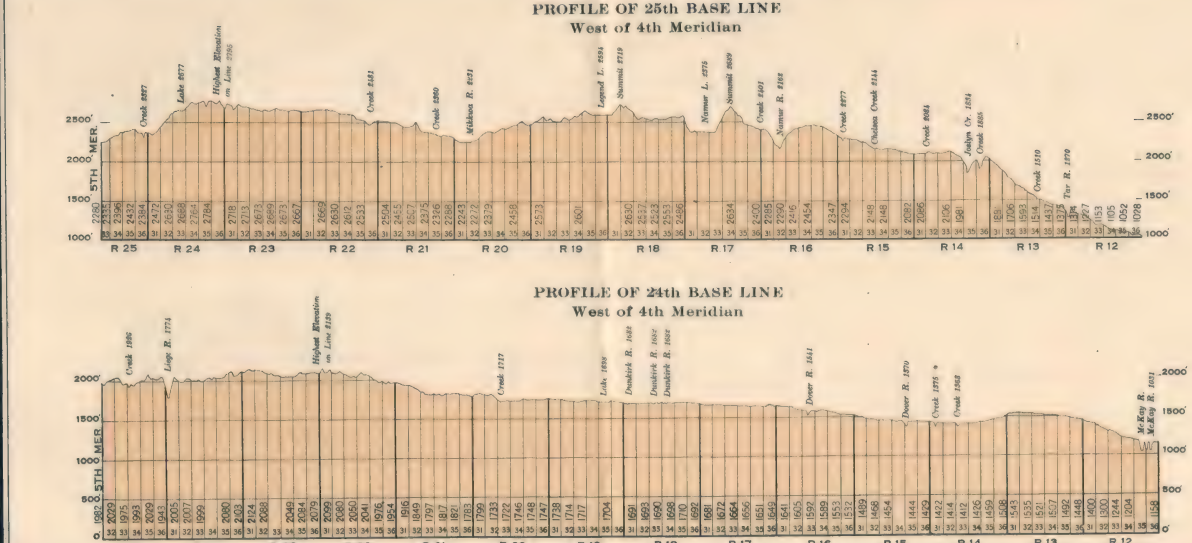
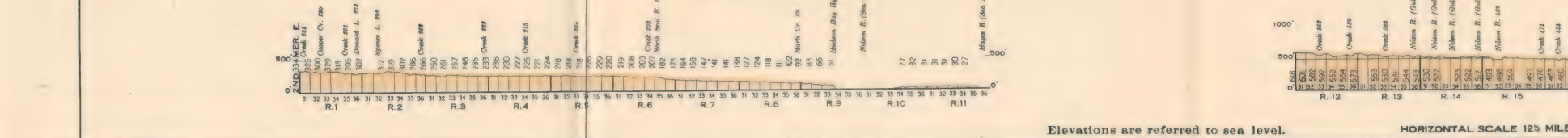
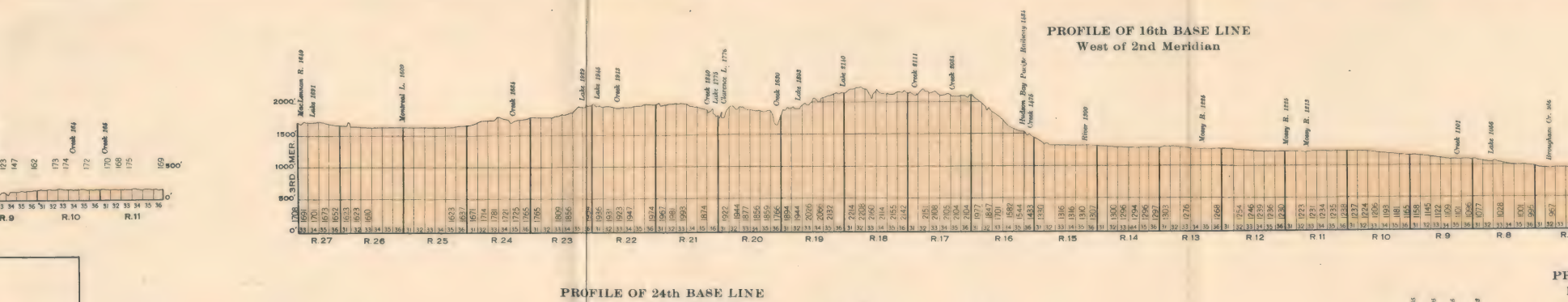
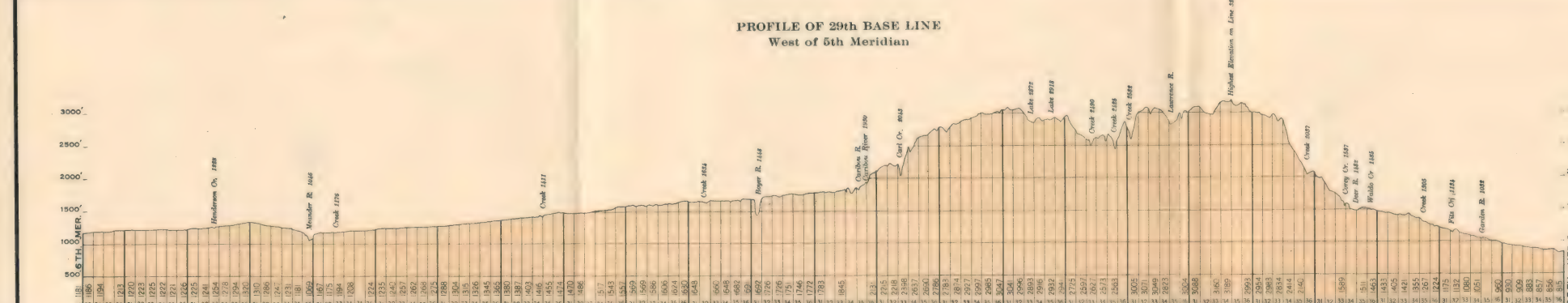
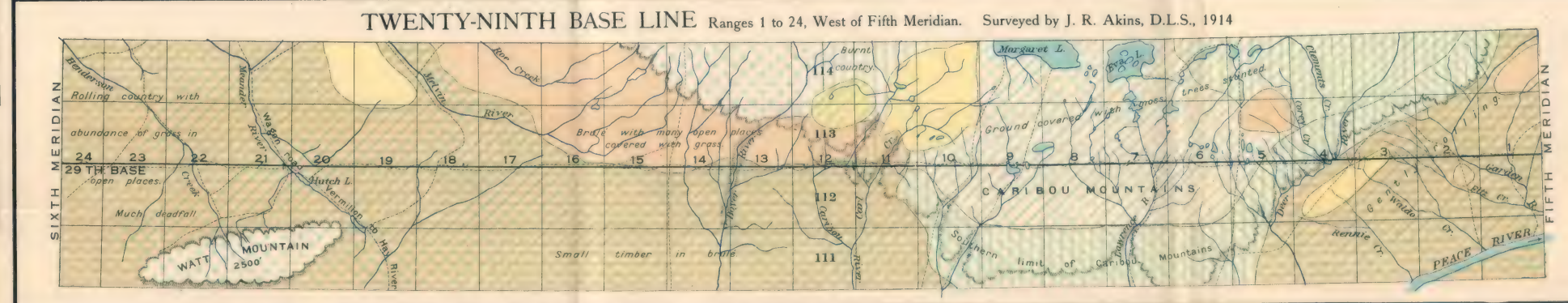
**THIRTEENTH BASE LINE**  
R. 1 to 2 and Secs. 31 to 32 of R. 3, E. of Pr. Mer.  
**TWELFTH BASE LINE** R. 2 to 3, E. of Pr. Mer.  
**EAST BOUNDARY OF RANGE 1**  
Townships 45 to 48, East of Principal Meridian  
**EAST BOUNDARY OF RANGE 3**  
Tps. 38 to 44, E. of Pr. Mer. by A. M. Naraway, D.L.S., 1914



**TWENTY-FOURTH BASE LINE** R. 1 to 10, E. of 2nd Mer. E. by B.W. Waugh, D.L.S., 1914-15 and R. 11 by G. H. Herriot, D.L.S., 1914-15  
**TWENTY-THIRD BASE LINE** R. 21 to 22, E. of Pr. Mer. by B.W. Waugh, D.L.S., 1914-15 and R. 1 to 11, E. of 2nd Mer. E. by G. H. Herriot, D.L.S., 1914-15  
**TWENTY-SECOND BASE LINE** R. 12 to 20, E. of Pr. Mer. by B.W. Waugh, D.L.S., 1914-15 and R. 21 to 22, E. of Pr. Mer. by G. H. Herriot, D.L.S., 1914-15  
**TWENTY-FIRST BASE LINE** R. 10 to 11, E. of Pr. Mer. by B.W. Waugh, D.L.S., 1914-15 and R. 12 to 20, E. of Pr. Mer. by G. H. Herriot, D.L.S., 1914-15  
**EAST BOUNDARY OF RANGE 11**  
Tps. 89 to 92, East of Second Mer. East by G. H. Herriot, D.L.S., 1914-15  
**EAST BOUNDARY OF RANGE 20** Tps. 85 to 88 E. of Pr. Mer. by B.W. Waugh, D.L.S., 1914-15 and Tps. 81 to 84, East of Pr. Mer. by G. H. Herriot, D.L.S., 1914-15  
**EAST BOUNDARY OF RANGE 11**  
Tps. 81 to 84 East of Pr. Mer. by B.W. Waugh, D.L.S., 1914-15  
**SECOND MERIDIAN EAST**  
Tps. 89 to 92 by B.W. Waugh, D.L.S., 1914-15 and Tps. 85 to 88 by G. H. Herriot, D.L.S., 1914-15



**TWENTY-SEVENTH BASE LINE**  
Ranges 1 to 9, West of Fifth Meridian by J. A. Fletcher, D.L.S., 1914  
**TWENTY-SIXTH BASE LINE**  
Ranges 1 to 25, W. of Fourth Mer. by F. V. Seibert, D.L.S., 1914, and Ranges 1 to 17, West of Fifth Meridian by J. A. Fletcher, D.L.S., 1914  
**TWENTY-FIFTH BASE LINE**  
Ranges 13 to 25, West of Fourth Meridian by G. H. Blanchet, D.L.S., 1914  
**TWENTY-FOURTH BASE LINE**  
Ranges 12 to 25, West of Fourth Meridian by G. H. Blanchet, D.L.S., 1914





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DEPARTMENT OF THE INTERIOR

## ANNUAL REPORT

OF THE

# TOPOGRAPHICAL SURVEYS BRANCH

1914-15

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OTTAWA

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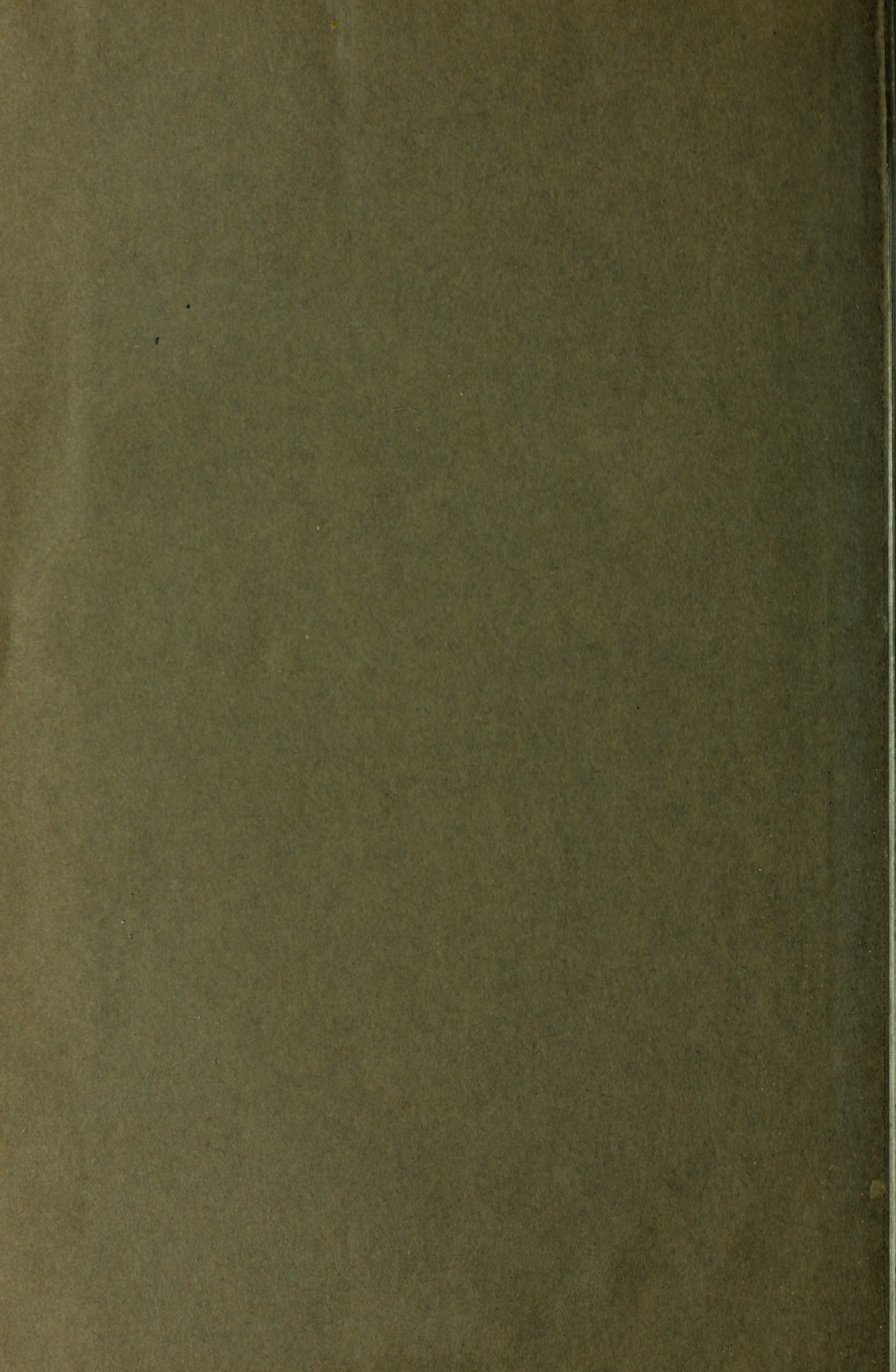


















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